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Instruction Manual

MODEL 845A & 845AB
HIGH IMPEDANCE VOLTMETER
NULL DETECTOR

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FLUKE
ELECTRONICS FOR INDUSTRY
INSTRUMENTS / COMPONENTS

JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133

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November, 1967

MODEL 845A & 845AB
HIGH IMPEDANCE VOLTMETER
NULL DETECTOR

845A serial no. 123 and above.

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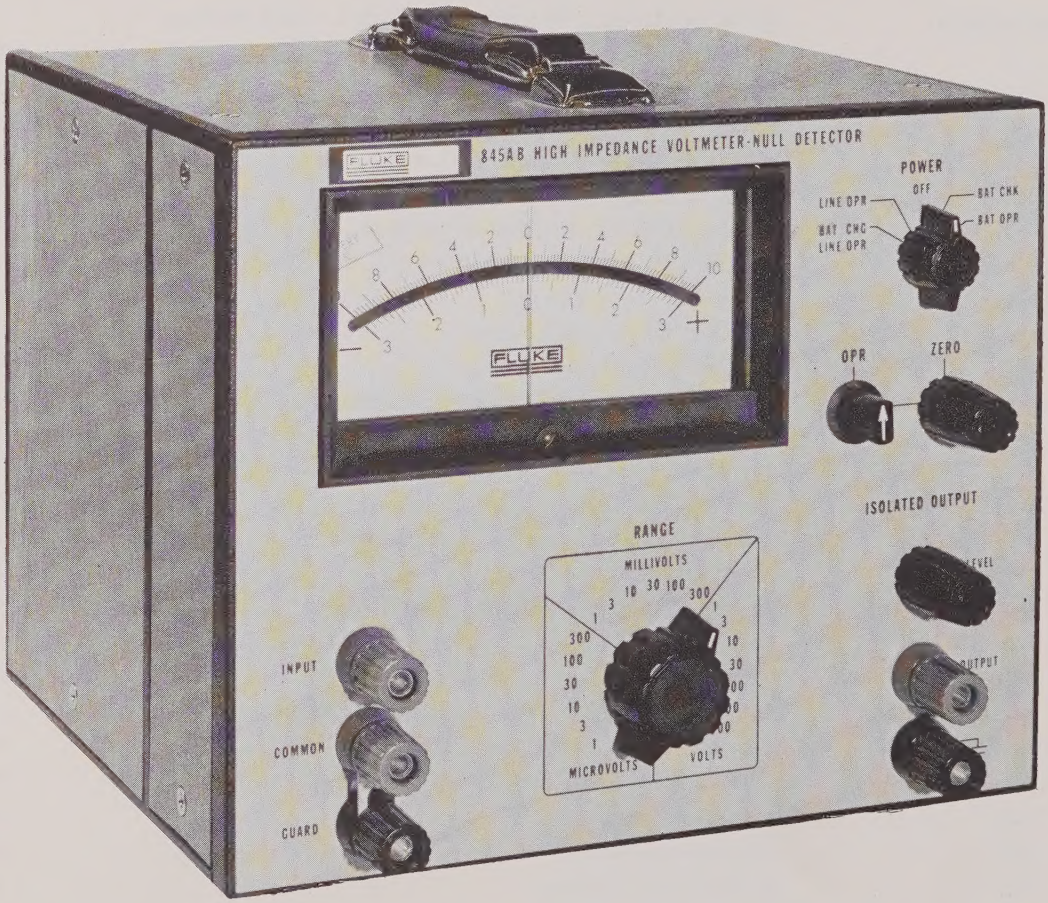


MODEL 845AB HIGH IMPEDANCE VOLTMETER-NULL DETECTOR

SECTION I

INTRODUCTION AND SPECIFICATIONS

1-1. INTRODUCTION

1-2. The Fluke Model 845 High Impedance Voltmeter-Null Detector allows measurement of dc voltages from one microvolt to 1000 volts dc in 19 ranges. When used as a null detector on the 100 millivolt range and below, the input impedance is 10 megohms. A linear recorder output allows the instrument to be used for production testing and also as a dc amplifier with a maximum gain of 120 db.

1-3. The instrument consists of the line powered Model 845A, and the line-battery-powered Model 845AB. The instruments are half-rack in size, and are equipped with resilient feet and a tilt-up bail for field or bench use. A single instrument may be mounted in a standard 19 inch rack by means of metal handle rack adapter kit 881A-102. Two instruments may be mounted side-by-side in a standard 19 inch rack by means of metal handle rack adapter kit 881A-103.

1-4. ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE RANGE
1 microvolt to 1000 volt dc end scale in nineteen ranges, using X1 and X3 progression.

INPUT RESISTANCE
100 megohms on 300 millivolt range and above.
10 megohms on 100 millivolt range and below.

ACCURACY
±(2% end scale + 0.1 microvolt).

MAXIMUM NOISE (input shorted)

RANGE	NOISE (peak-to-peak)
1 microvolt	0.20 microvolt
3 microvolt	0.25 microvolt
10 microvolt - 1000 volt	0.30 microvolt

METER RESPONSE TIME (to 90% of reading)

RANGE	TIME
1 microvolt	5 seconds
3 microvolt	3 seconds
10 microvolt - 1000 volt	1-1/2 seconds

INPUT ISOLATION
Better than 10^{12} ohms at less than 50% relative humidity and 25° C regardless of line, chassis, or recorder grounding. Better than 10^{10} ohms up to 80% relative humidity and 35° C. With driven guard, isolation improves by at least one order of magnitude up to 10^{13} ohms. Any input terminal may be floated 1100 volts off chassis ground.

DC COMMON MODE REJECTION
Better than 160 db, input short-circuited, 80% relative humidity.
Better than 140 db, open-circuited, 50% relative humidity.
Better than 120 db, open-circuited, 80% relative humidity.

AC COMMON MODE REJECTION (below 100 kHz)
100 volts rms or 120 db greater than end scale, whichever is less, will effect reading less than 2% of end scale. Input open-circuited.

AC NORMAL MODE REJECTION (60 Hz and above)
AC voltages 60 db above end scale will effect reading less than 2% of end scale. Maximum ac voltage not to exceed 750 volts rms.

RECORDER OUTPUT
0-1 volt, one side at chassis ground; linear to 0.5% of end scale. Source impedance, 5k to 7.5k.

STABILITY OF ZERO
Better than 0.15 microvolt/hour.
Better than 0.3 microvolt/day.

TEMPERATURE COEFFICIENT OF ZERO
Less than 0.1 microvolt/° C from 15° C to 35° C.
Less than 0.2 microvolt/° C from 0° C to 50° C.

ZERO CONTROL RANGE
±5 microvolt minimum.

OVERLOAD PROTECTION
Up to 1100 volts dc may be applied on any range. Typical recovery time is 4 seconds.

INPUT POWER
Model 845A
115/230 volts ac ±10%, 50 to 440 Hz, approximately 3 watts.
Model 845AB
Rechargeable battery or 115/230 volts ac ±10%, 50 to 440 Hz, approximately 6 watts during recharge (40 hours operation on full charge, batteries trickle-charged while instrument operates from line power).

1-5. ENVIRONMENTAL SPECIFICATIONS

OPERATING TEMPERATURE RANGE
Within all specifications from 15° C to 35° C.
Within all specifications from 0° C to 50° C except:
Maximum noise and meter response time - derated by a factor of two.
DC Common Mode Rejection - derated by 20 db.

STORAGE TEMPERATURE RANGE
Model 845A -40° C to +70° C.
Model 845AB -40° C to +60° C.

RELATIVE HUMIDITY RANGE
0 to 80%.

SHOCK
Meets hammer blow requirements of MIL-T-945A and MIL-S-901B.

VIBRATION
Meets 10 Hz to 55 Hz tests of MIL-T-945A.

1-6. MECHANICAL SPECIFICATIONS

MOUNTING
Resilient feet provide for bench and portable use. For side-by-side EIA rack mounting of two units, add Adapter Kit 881A-103 (includes handle-brackets and key plate). For EIA rack mounting of a single unit, add Adapter Kit 881A-102.

WEIGHT
Model 845A 9 pounds.
Model 845AB 10-1/4 pounds.

SIZE
8 inches high by 8-1/2 inches wide by 9 inches deep.

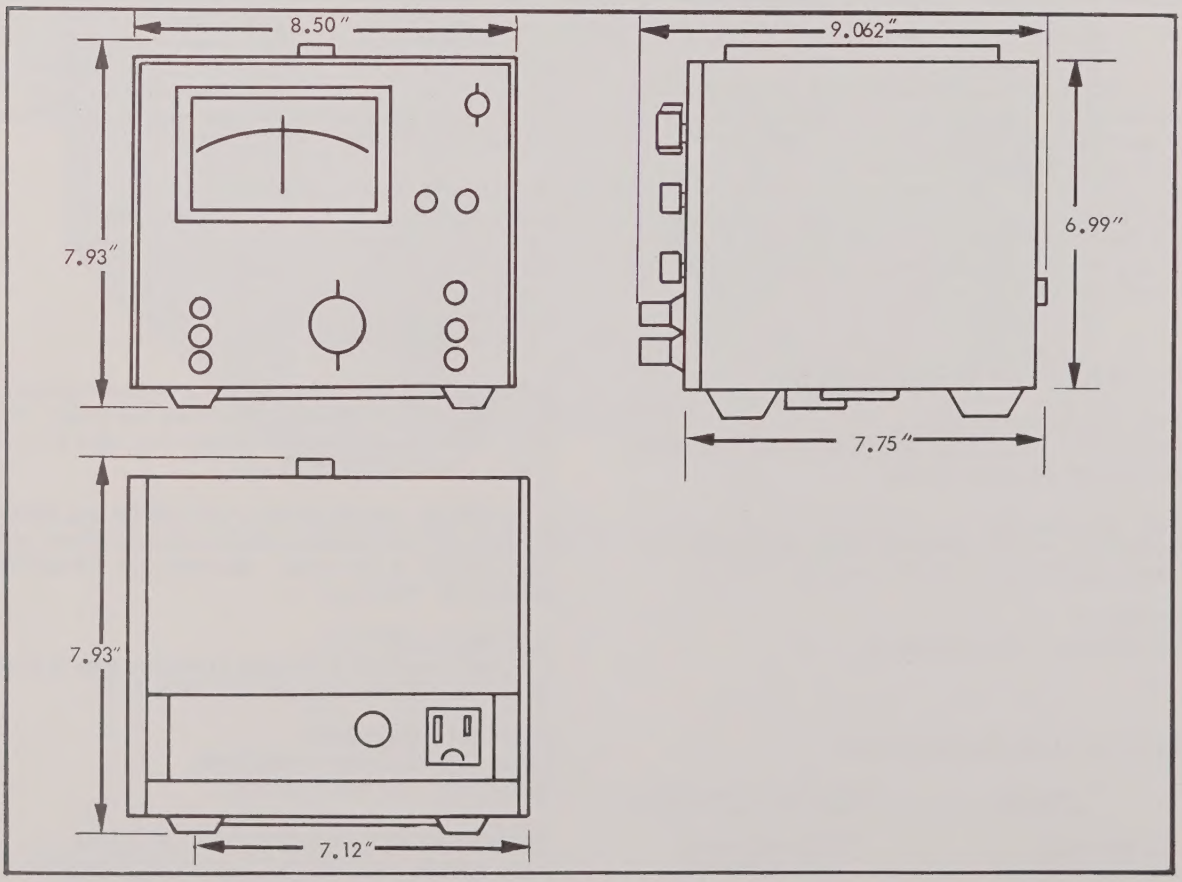


Figure 1-1. MODEL 845 OUTLINE DRAWING

SECTION II

OPERATING INSTRUCTIONS

2-1. RECEIVING INSPECTION

2-2. This instrument has been thoroughly tested and inspected before being shipped from the factory. Immediately upon receiving the instrument, carefully inspect for damage which may have occurred during shipment. If any damage is noted, follow the instructions outlined in the warranty page at the back of this manual.

2-3. CONTROLS, TERMINALS, AND INDICATOR

2-4. The location and function of the front-panel controls are described in Figure 2-1. Detailed operating descriptions are given in the following paragraphs.

2-5. PRELIMINARY OPERATION

2-6. Connect the Model 845 line plug to a 115 volt ac power outlet or to 230 volts ac, if the instrument is so wired. If your instrument is a Model 845A, proceed with steps a and b. If your instrument is a Model 845AB, check the batteries as outlined in paragraph 2-7. Upon completion of a satisfactory battery check, proceed with steps c and d.

WARNING!

The round pin on the polarized three-prong plug connects the instrument case to power system ground. Use a three-to-two pin adapter when connecting to a two-contact outlet. For personnel safety, connect the short lead from the adapter to a high-quality earth ground.

a. Place the Model 845A controls as follows:

POWER	ON
RANGE	10 MICROVOLTS
OPR	ZERO

b. Adjust the ZERO control for an initial zero meter deflection. Place the RANGE switch to the 1 MICROVOLT RANGE and re-zero with the ZERO control.

c. Place the Model 845AB controls as follows:

POWER	LINE OPR or BAT OPR
RANGE	10 MICROVOLTS
OPR	ZERO

d. Adjust the ZERO control for an initial zero meter deflection. Place the RANGE switch to the 1 MICROVOLT RANGE and re-zero with the ZERO control.

2-7. MODEL 845AB BATTERY CHECK

2-8. The Model 845AB batteries must be in the proper charge state for the instrument to operate properly in the BAT OPR mode. To check the batteries proceed as follows:

a. Place the POWER switch to BAT CHK position.

b. The Model 845AB meter needle should deflect within the BATTERY OK region. If the meter needle does not stay within the BATTERY OK region for at least 10 seconds, charge the batteries as indicated in paragraph 2-9. If the batteries are adequately charged, refer to paragraph 2-5.

2-9. MODEL 845AB BATTERY CHARGING

2-10. If the Model 845AB is left in the BAT OPR mode for an extended period of time, the batteries will become discharged. If the batteries are fully discharged, the instrument will not operate properly in the LINE OPR mode until the battery voltage can be brought up to 3/4 of full voltage. This will require about 15 minutes of charging. To charge the Model 845AB batteries proceed as follows:

a. Connect the line plug to a 115 volt ac power outlet or to 230 volts ac, if the instrument is so wired.

b. Place the POWER switch to BAT-CHG LINE OPR. After 16 hours the batteries will be fully charged and capable of operating the instrument for at least 40 hours.

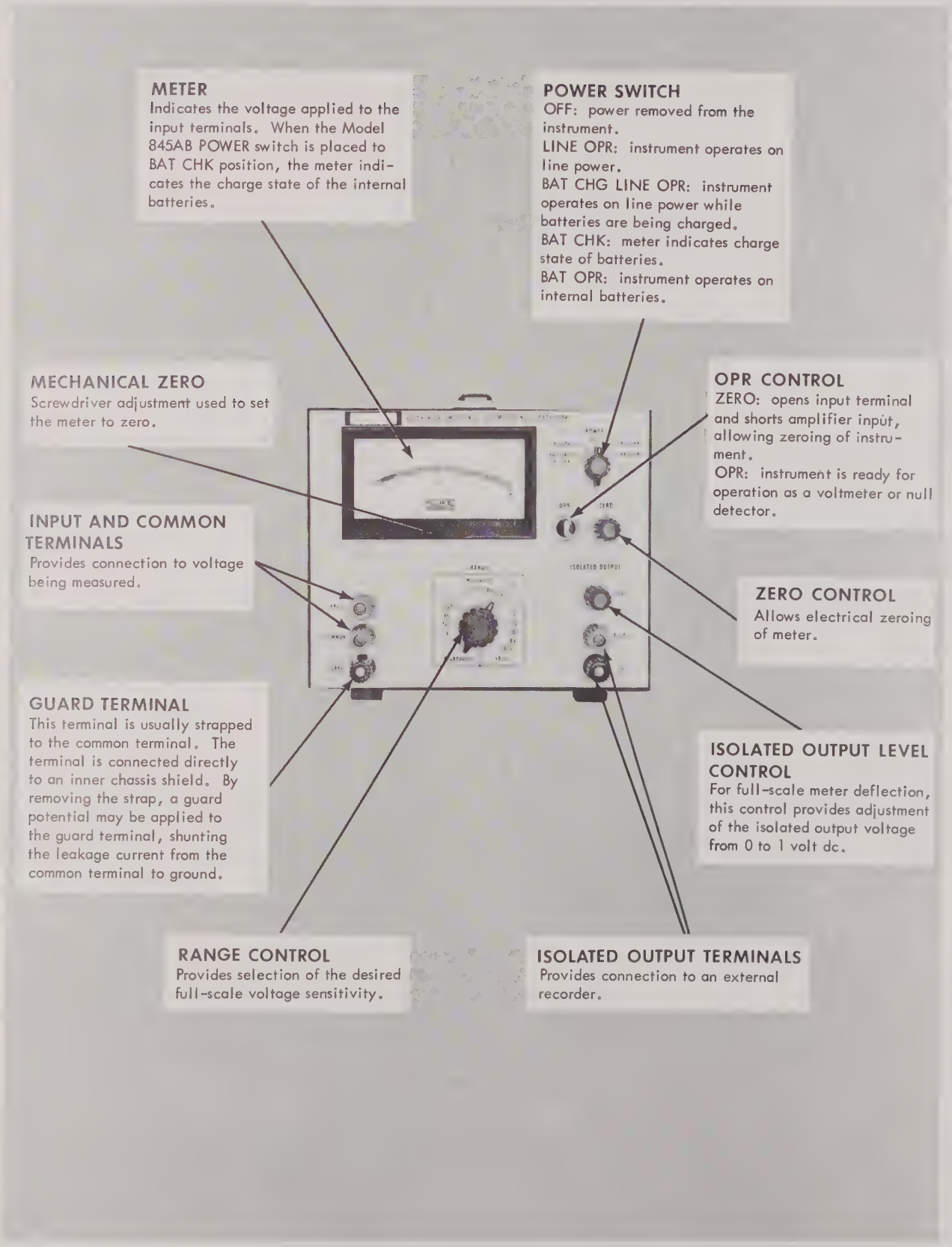

METER
Indicates the voltage applied to the input terminals. When the Model 845AB POWER switch is placed to BAT CHK position, the meter indicates the charge state of the internal batteries.
POWER SWITCH
OFF: power removed from the instrument.
LINE OPR: instrument operates on line power.
BAT CHG LINE OPR: instrument operates on line power while batteries are being charged.
BAT CHK: meter indicates charge state of batteries.
BAT OPR: instrument operates on internal batteries.
MECHANICAL ZERO
Screwdriver adjustment used to set the meter to zero.
OPR CONTROL
ZERO: opens input terminal and shorts amplifier input, allowing zeroing of instrument.
OPR: instrument is ready for operation as a voltmeter or null detector.
INPUT AND COMMON TERMINALS
Provides connection to voltage being measured.
ZERO CONTROL
Allows electrical zeroing of meter.
GUARD TERMINAL
This terminal is usually strapped to the common terminal. The terminal is connected directly to an inner chassis shield. By removing the strap, a guard potential may be applied to the guard terminal, shunting the leakage current from the common terminal to ground.
ISOLATED OUTPUT LEVEL CONTROL
For full-scale meter deflection, this control provides adjustment of the isolated output voltage from 0 to 1 volt dc.
RANGE CONTROL
Provides selection of the desired full-scale voltage sensitivity.
ISOLATED OUTPUT TERMINALS
Provides connection to an external recorder.

Figure 2-1. CONTROLS, TERMINALS, AND INDICATORS

2-11. MECHANICAL ZEROING

2-12. It may be necessary to adjust the mechanical zero control of the Model 845 at more frequent intervals than complete calibration. To mechanically zero the instrument proceed as follows:

a. Place the RANGE switch to 1000 VOLTS and the POWER switch to ON or to LINE OPR.

b. Adjust the mechanical zero adjustment screw for zero meter deflection.

c. Place the RANGE switch to 10 MICROVOLTS and electrically zero the instrument as outlined in paragraph 2-5.

d. Repeat steps a through c until the meter is mechanically and electrically zeroed.

2-13. OPERATION AS A HIGH IMPEDANCE VOLTMETER

2-14. To operate the Model 845 as a High Impedance Voltmeter, perform the preliminary operations according to paragraph 2-5 and proceed as follows:

a. Place the controls as follows:

POWER	ON/LINE OPR or BAT OPR
OPR	OPR
RANGE	1000 VOLTS

Note!

When measuring voltages in the microvolt ranges, use copper wire having low thermal EMF's.

b. Connect the voltage to be measured to the Model 845 INPUT terminal and connect the common point of the voltage being measured to the Model 845 COMMON terminal.

c. Deflection of the meter indicates the polarity and magnitude of the measured voltage. Increase the sensitivity of the Model 845 for maximum on-scale deflection.

2-15 OPERATION AS A NULL DETECTOR

2-16. The Model 845 may be used to monitor small voltage differences in bridge circuits, potentiometers, and other measuring apparatus. In most of these applications the circuits are adjusted for zero deflection or a null on the Model 845. Equipment connections for various types of null detector configurations are illustrated by Figure 2-2 through 2-4. To operate the Model 845 as a Null Detector perform the preliminary operations according to paragraph 2-5 and proceed as follows:

a. Select the desired equipment application as illustrated by Figure 2-2 through 2-4 and make the appropriate equipment connections.

b. Place the Model 845 controls as follows:

POWER	ON/LINE OPR or BAT OPR
OPR	OPR
RANGE	as desired

c. Adjust the circuit being measured for zero or a null deflection on the Model 845 meter.

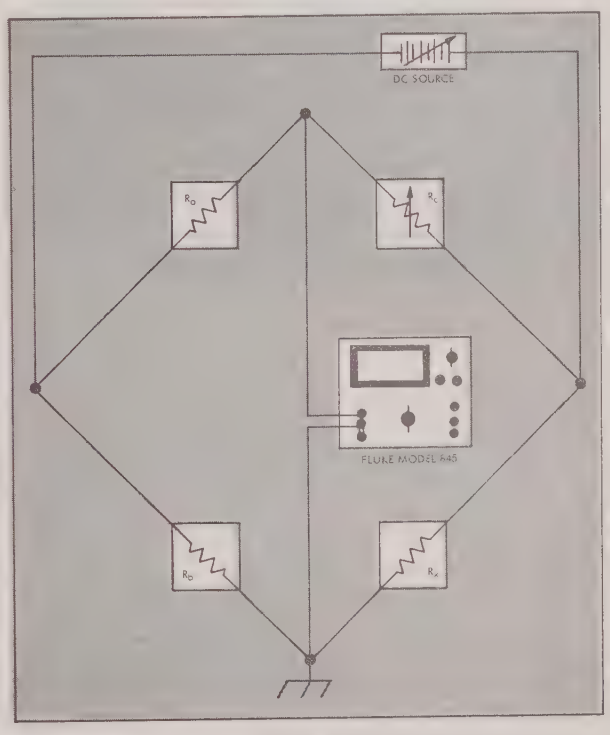


Figure 2-2. BRIDGE DETECTOR-FLOATING SUPPLY

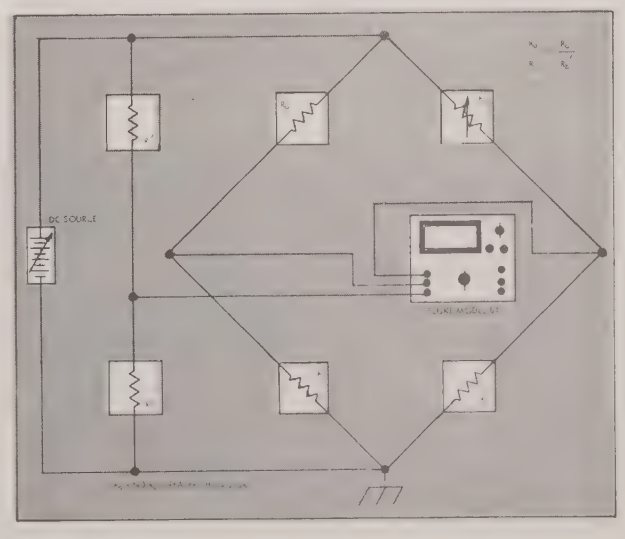


Figure 2-3. BRIDGE DETECTOR-HIGH RESISTANCE

SECTION III

THEORY OF OPERATION

3-1. INTRODUCTION

3-2. The Model 845 High Impedance Voltmeter-Null Detector theory of operation is contained in this section of the manual. A block diagram is illustrated in Figure 3-1, and a functional schematic diagram is located at the end of Section V. The block diagram and functional schematic diagram are to be used as an aid in understanding circuit theory, and in troubleshooting.

3-3. BLOCK DIAGRAM ANALYSIS

3-4. The Model 845 is a photo-chopper stabilized amplifier with the overall gain of the amplifier being precisely controlled by negative feedback. The instrument's main circuits are an input range divider, a photocell modulator, an ac amplifier, a synchronous demodulator, a dc amplifier, a meter, an isolation converter, a neon drive, an 84 Hz multivibrator, a supply rectifier, and a rectifier filter.

3-5. The input range divider provides a fixed input impedance to signals of less than 1 millivolt and allows reduction of input signals above 1 millivolt. Photo-choppers modulate the input signal to the ac amplifier at 84 Hz. The drive signal for the photo modulator is provided by the neon drive which is composed of neon lamps driven alternately at 84 Hz by the 84 Hz multivibrator. The 84 Hz signal provides the Model 845 with an operating frequency asynchronous with the power line frequency and power line harmonics. The 84 Hz multivibrator also drives the following circuits; (1) the supply rectifiers which provide operating voltages for the amplifiers, (2) the isolation converter which provides the isolated recorder output, (3) the synchronous demodulator which demodulates the amplified dc signal. The entire amplifier and the secondaries of both transformers are surrounded by a guard shield which permits the use of external guard voltages.

3-6. The ac amplifier is a high impedance amplifier whose gain is controlled by the resistance selected by the RANGE control. The amplified dc signal is then detected by the synchronous demodulator.

3-7. Demodulation of the output signal of the ac amplifier is accomplished by a synchronous demodulator. The synchronous demodulator is driven by the 84 Hz reference signal and detects the amplified dc signal. The detected dc signal is then amplified by a dc amplifier whose gain is controlled by fixed feedback. The output signal of the dc amplifier drives the meter which indicates the polarity and magnitude of the measured voltage, and the isolation converter which drives the isolated recorder output. This same dc signal is also fed back to the input of the ac amplifier to control overall amplifier gain. The feedback ratio is determined by the setting of the RANGE control and allows overall amplifier gain to be precisely controlled.

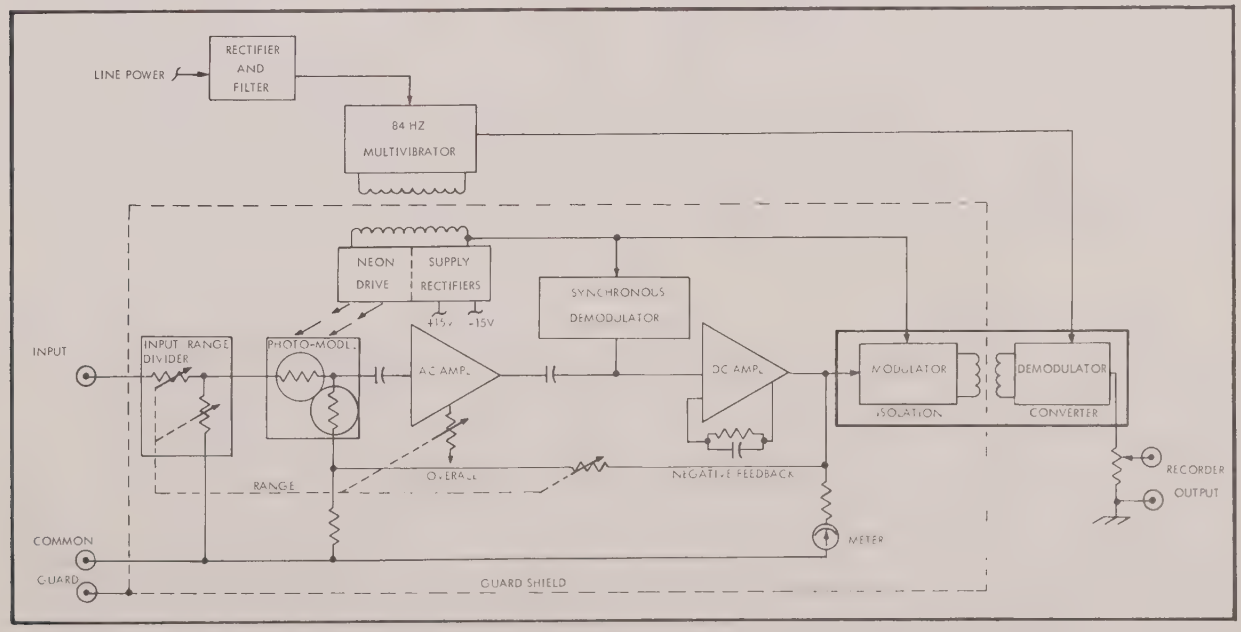


Figure 3-1. MODEL 845 BLOCK DIAGRAM

3-8. CIRCUIT DESCRPTION

3-9. THE POWER SUPPLY

3-10. Input power transformer T201 receives 115 volts ac, or 230 volts ac if the instrument is so wired, through the power switch, S201. The primary winding of T201 is constructed in such a manner as to utilize either 115 volts ac input, windings parallel, or 230 volts ac, windings in series. Fuse, F1, protects the Model 845 circuitry from overloads.

3-11. The secondary voltage of T201 is rectified by bridge rectifier CR201 through CR204. An additional bridge leg composed of CR205 and CR206, is used on the Model 845AB for charging of the batteries. This additional leg allows charging of the batteries while using the instrument on line power and also references the bridge rectifier to the battery voltage, providing regulation of the dc output voltage. When the POWER switch S201 is placed to the BAT CHK position, meter multiplier resistor R205, and meter shunt resistor R157, are selected. The output dc voltage of the batteries under an actual load condition is then indicated by the meter of the Model 845AB. The Model 845A bridge rectifier output voltage is regulated by zener CR207. Capacitor C201 filters the output dc voltage on both Model 845 instruments. This regulated output is used as the operating voltage for the 84 Hz multivibrator.

3-12. The 84 Hz multivibrator is used to provide synchronous drive voltages and dc operating voltages for the Model 845 amplifier circuits free from any power line frequency variations and harmonics. The multivibrator is a transformer-coupled free running multivibrator composed of transistors Q201 and Q202, transformer T202, and frequency determing components C203 and R206 through R208. Variable resistor R206 is used to adjust the frequency of the multivibrator to 84 Hz. The voltage at the secondary of T202 is rectified by CR104 and CR105 to produce the positive and negative 15 volt dc operating voltages for the amplifier circuits. The same winding furnishes the synchronous demodulator and isolation converter drive signals and is tapped at a higher voltage level to drive the neon lamps DS101 and DS102. The neon lamps provide the drive signals for the photocell modulators V101 and V102.

3-13. THE INPUT DIVIDER

3-14. The basic full-scale sensitivity of the Model 845 is limited to a maximum of 1 millivolt. Therefore, input signals above this value must be reduced. The input divider consists of R101 through R109 and RANGE switch S101A. On ranges being a multiple of 1, input voltages above 1 millivolt are divided down to 1 millivolt or less, upon selection of the proper range. On ranges being a multiple of 3, input voltages above 1 millivolt are divided down to 300 microvolts or less, upon selection of the proper range. On ranges of 1 millivolt and below, a 10 megohm resistor, R104, is connected across the input to provide a fixed value of input impedance.

3-15. THE AC AMPLIFIER

3-16. The input signal from the input divider is filtered by a three stage, low-pass filter composed of R110, C101, R111, C102, R112, and C103. This filter reduces any ac voltage having a frequency above 1 Hz. The filtered dc voltage is then square-wave modulated by photochoppers V101 and V102, which are driven by DS101 and DS102. The resulting square-wave signal is coupled through C104 and amplified by Q101, Q102, and Q103 which form a three stage ac amplifier having a high input impedance. The gain of the ac amplifier is controlled by the common emitter resistance selected by the RANGE switch S101B. Maximum gain is used on the 1, 3, 10, and 30 microvolt ranges and is gradually reduced by the selection of R124 through R126 as the range is increased. The output of Q103 is capacitively coupled to a two stage current amplifier composed of Q104 and Q105. The current amplifiers have a constant gain controlled by fixed negative feedback through R130 and C111.

3-18. THE SYNCHRONOUS DEMODULATOR

3-19. The synchronous demodulator detects the magnitude and phase of the amplified signal. The 84 Hz drive signal is applied to the base of transistor Q106 which references the synchronous demodulator to the same phase as the photo modulator. The demodulated signal is filtered by R134 and C114 before being applied to the dc amplifier.

3-20. THE DC AMPLIFIER

3-21. The dc amplifier amplifies the detected dc signal from the synchronous demodulator. Transistors Q107 through Q112 comprise a two-stage differential amplifier with a complementary emitter-follower output. Negative feedback through R149 and C116 is applied to the base of Q108 and controls the dc amplifier gain. The output from the common emitter of Q111 and Q112 is 1 volt dc for a full range input on any range, which drives the meter and isolation converter. Overall negative feedback through the resistive network of R138 through R142 and R114 is controlled by the position of the RANGE switch S101C. This negative feedback allows precise control of the overall gain of the Model 845 amplifiers.

3-22. THE ISOLATION CONVERTER

3-23. The isolation converter drives the recorder output and provides isolation from the Model 845 amplifier circuitry. The output signal from the dc amplifier is applied to the transistors Q113 and Q114. An 84 Hz reference drive signal is applied to the bases of transistors Q113 and Q114 which causes modulation of the dc input signal to occur. The resulting modulated signal is coupled to the secondary of T203 where transistors Q203 and Q204 demodulate secondary signals occuring at their 84 Hz base signal rate. Capacitor C204 charges to the peak of the demodulated signal and discharges through the OUTPUT LEVEL control R1. C3 and R2 filter the resulting dc output voltage for the recorder output.

SECTION IV

MAINTENANCE

4-1. INTRODUCTION

4-2. The Model 845A and 845AB instruments should be checked for calibration annually. Without extreme abuse all that should be required is periodic cleaning and calibration as specified in this section. If a problem arises, refer to the information on corrective maintenance in this section.

4-3. TEST EQUIPMENT

4-4. Figure 4-1 lists the recommended equipment and their specifications which are required for maintenance and calibration.

4-5. BATTERY REPLACEMENT

4-6. Batteries in the Model 845AB need to be replaced when 16 hours of charging will no longer bring the meter to the minimum BATTERY OK region.

4-7. To replace the batteries proceed as follows:

a. Remove upper and lower dust covers of the Model 845AB.

b. Locate the battery pack which is mounted below the power supply printed circuit assembly and unsolder the black and red leads that electrically connect the battery pack to the power supply printed circuit assembly.

c. Remove the six nuts and screws that attach the battery pack to the power supply printed circuit assembly.

d. Remove the battery pack from the Model 845AB and replace the defective batteries observing the connections and polarities as illustrated in Figure 4-2.

e. Replace the battery pack in the Model 845AB, securing it to the power supply printed circuit assembly and chassis assembly with the six screws and nuts removed in step c.

f. Replace the battery pack black and red leads removed in step b, and replace the upper and lower dust covers.

g. Check the batteries as outlined in paragraph 2-7. If the batteries show a discharge, recharge them as outlined in paragraph 2-9.

4-8 230 VOLT AC POWER-LINE CONVERSION

4-9. All versions of the Model 845 may be converted for operation on 230 volt ac line power by modifying the power supply printed circuit assembly wiring. Factory modified versions will have a decal on the rear panel indicating a 230 volt ac input requirement.

4-10. To convert the Model 845 to 230 volt ac operation proceed as follows:

a. Remove the top-back dust cover.

b. Locate T201 on the power supply printed circuit assembly and remove the two jumper wires labeled 115V. Refer to Figure 4-3, for location.

EQUIPMENT NOMENCLATURE	SPECIFICATIONS	RECOMMENDED INSTRUMENT
DC POWER SUPPLY	Output voltage of 0 to 1000 volts dc. Accuracy of ±0.25% or 100 microvolts.	Fluke Model 332A
Oscilloscope	Voltage sensitivity of 200 uv/cm.	Hewlett-Packard Model 130C
	Sweep speed of 2 ms/cm.	
Battery	10 volt	

Figure 4-1. TEST EQUIPMENT REQUIREMENTS

c. Place the jumpers removed in step b across the 230V labeled terminals, refer to Figure 4-3 for location, and solder the connections.

d. Replace the top-back dust cover and install a 3AG 1/32 ampere fuse in place of F1.

Figure 4-2. BATTERY POLARITY CONNECTIONS

4-11. DISASSEMBLY INSTRUCTION

4-12. The following procedure can be used to gain access to the inside of the Model 845:

a. Remove the top-back cover by removing four screws that fasten it to side castings. This allows access to the parts on the power supply board (parts with 200 series reference designations.)

b. Remove the bottom cover by removing two screws that fasten it to side castings. This allows access to capacitors C1 and C2 on the front panel.

c. Remove the large side cover on both sides of instrument by removing two screws that fasten each of them to side castings.

d. Remove the top cover of the guard chassis by removing four screws; two screws on the top of the guard and two on the back. This allows access to the dc amplifier Q107 through Q112, and the last two stages of the ac amplifier, Q104 through Q106. The instrument will still operate properly with the top of guard chassis removed. When the instrument is turned on, a red neon glow from the two lucite rods on the amplifier board is an indication that the photo-modulator drive circuit is working.

e. Remove the bottom-back cover of guard chassis by removing two screws on bottom. This allows access to; the input divider R101 to R110, the +15 and -15 volt dc supply filter capacitors C117 and C118, and the recorder output modulator Q113 and Q114. The instrument will still operate but will have a meter offset, especially with high source impedances.

f. Remove the screw that fastens the right side casting to the front panel at the top of the instrument.

g. Remove the small right side cover by removing the two screws that attach it to the chassis.

h. Loosen the four screws located below the removed small right side cover, by two turns only.

CAUTION!

Avoid touching polyethelene grommets. Contamination will cause excessive electrical leakage.

i. Remove the top and bottom screws that fasten the right side casting to the power supply board bracket.

j. Loosen the top and bottom screws that fasten the left side casting to the power supply board bracket by two turns.

k. Take off the power plug bracket at the rear of the instrument by removing two screws that fasten it to the side castings.

l. Pull the rear of the right side casting out far enough to swing the power supply board bracket out from the back of the instrument. This will allow access to the entire component side of the amplifier board.

m. Remove the input shield located at the end of the Lucite rods by removing the two attaching screws. This will allow access to the first three amplifier stages Q101 to Q103, and the chopper drive photocells V101 and V102.

n. If it is necessary to gain access to the land side of amplifier board, proceed as follows:

(1) Place the RANGE control to 1 MICROVOLTS and loosen the RANGE switch set screw that points toward the bottom of the instrument.

(2) Place the RANGE switch to 1000 VOLTS and loosen the other set screw that now points down, and take off the RANGE knob.

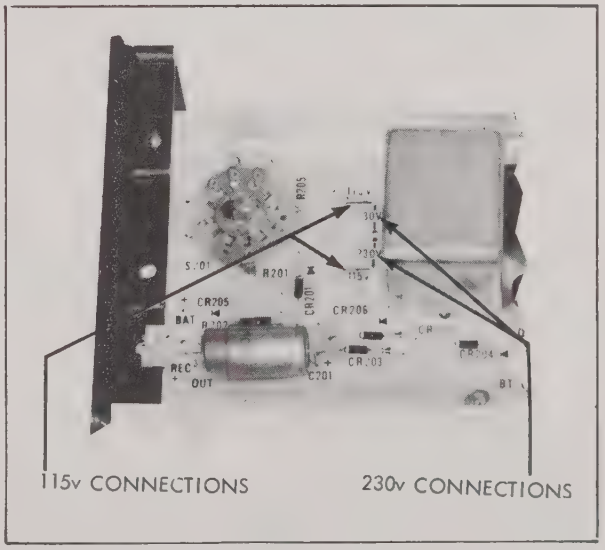


Figure 4-3. T201 115/230VOLT AC POWER TERMINALS

(3) Loosen the set screw on the ZERO control shaft coupler where it connects to the potentiometer.

(4) Using a 1/2" socket wrench, remove the nut that holds the range switch to the guard chassis.

(5) Remove the four screws that hold the amplifier board to the guard chassis.

(6) Slide the amplifier board toward the rear of the instrument. This will allow access to the land side of the amplifier board.

4-13. CORRECTIVE MAINTENANCE

4-14. TROUBLESHOOTING

4-15. The purpose of troubleshooting is to locate and replace as quickly as possible any malfunctioning component or components that are causing improper operation. The causes and remedies of the more common troubles that may occur are listed in the troubleshooting chart, Figure 4-4. Waveforms useful for troubleshooting are given in Figures 4-5 through 4-10. A complete understanding of the theory of operation and familiarity with the schematic diagram is the best way to locate and correct the cause of any malfunction.

4-16. VISUAL INSPECTION

4-17. Troubles may sometimes be located by a thorough visual inspection. This may be accomplished by looking for the following symptoms:

a. Accumulations of dirt, dust, moisture, or grease. Remove contamination as outlined in paragraph 4-18.

b. Scorched or burned parts. Damage of this type is usually caused by other defective components. Determine the cuase of damage before replacing the components.

SYMPTOM	PROBABLE CAUSE	REMEDY
Blows fuses	Short circuit across secondary of T201	Test for short circuit between pins 3 and 6.
	Shorted turn in T201	Unsolder R202 in secondary of T201. A shorted turn will require almost as much current as normal operation.
	Defective CR201 through CR206	Measure voltage of C201. Should be 10.5 volts. If near zero, replace CR201 thru CR206, as necessary.
Photo Modulator inoperative (Neon lights out)	Low battery voltage	Charge batteries.
	Defective Q201 or Q202	If voltage of C201 is less than 7 volts, and batteries are charged, replace Q201 and/or Q202.
	Open winding on T202, or open C203	Waveform on TP10 should agree with Figure 4-5. If square wave is absent, T202 or C203 is defective.
	No drive to neon lamps DS101 and DS102	A square wave of over 200 volts peak-to-peak should be present between pin 9 of T202 and the GUARD terminal. If not, T202 may be defective.
Meter movement inoperative	Dead meter	Check meter with an ohmmeter. Panel meter should peg. (Model 845AB in LINE OPR, line cord disconnected).
	Defective auxiliary supply	Measure voltage is near zero, check the associated diode and capacitor. If both voltages are zero, T202 is defective.

Figure 4-4. TROUBLESHOOTING CHART (Sheet 1 of 2)

SYMPTOM	PROBABLE CAUSE	REMEDY
Meter pegs or wanders	Meter mechanically stuck Defective amplifier	Using an oscilloscope with dc coupling, measure waveforms at TP6. If waveforms agree with Figure 4-6 check Q111, Q112, Q109, Q110, Q107, and Q108 by replacement. If waveforms are not correct, then: (a) Waveform at TP6 looks more like waveform at TP7, Figure 4-7, Q106 is open. (b) No change in waveform at TP6 as ZERO control is rotated. R114 is shorted, base of Q101 is shorted, V101 or V102 is shorted. (c) Waveform at TP6 looks like a square wave. Measure waveform at TP7. If square wave disappears and waveform at TP7 is correct, C112 is shorted. If waveform is not correct, remove Q104 and measure waveform at TP2, Figure 4-8. If square wave persists, short junction of R115, C104, C105, and base of Q101 to common. If square wave disappears, remove short and transfer short to R112, C103, and V101 junction. If square wave returns, a photocell is defective, or C104 is shorted. If square wave does not return, move the short to the end of R110 that connects to RANGE switch. If square reappears, CR101 or CR102 is defective. If square wave does not reappear, the RANGE switch is defective. (d) No signal at TP6. If there is also no signal at TP7, Q106 is probably shorted. If Q106 is satisfactory, measure waveform at TP2. If there is still no signal, C107, CR103, Q101, Q102, or Q103 is defective.
ISOLATED OUTPUT operates on one polarity only	Open winding on T203, defective Q113, Q114, Q203, or Q204	Check and replace as necessary.
Slower response in negative direction	Leaky C120	Test and replace if necessary.
Measurements are low on high-sensitivity ranges	Shorted C116	Test and replace if necessary.
Poor stability	Defective CR207 Batteries not charged	Replace if necessary. Charge batteries as in paragraph 2-9.
Noise on 1, 3, and 10 uv ranges	Dirty or defective Q101, or defective Q102 Defective chopper	Measure waveform at TP2. Figure 4-9 waveform shown in normal. Additional noise at TP2 is due to dirty Q101 or defective Q102. Remove Q111 and Q112, and apply an input of 1 mv. Observe waveform at TP1. For waveform shown in Figure 4-10: (a) Excessive noise can be caused by poor positioning of neon lamps. (b) Smaller waveform can be caused by slow response of photocells; if so, replace cells.
Unguarded leakage poor	Dirty grommets Leakage in T202 or T203	Clean according to paragraph 4-18. Test and replace if necessary.
Guarded leakage poor	Leakage in T202 or T203, or pins touching circuit board Contaminated binding posts	Test and repair as necessary. Clean according to paragraph 4-18.
Poor overload recovery	Defective C101, C102, C103, C120, CR101, CR102, or R110	Test and replace as necessary.

Figure 4-4. TROUBLESHOOTING CHART (SHEET 2 OF 2)

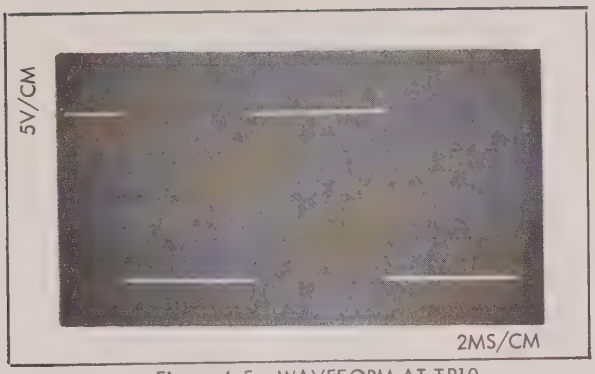


Figure 4-5. WAVEFORM AT TP10

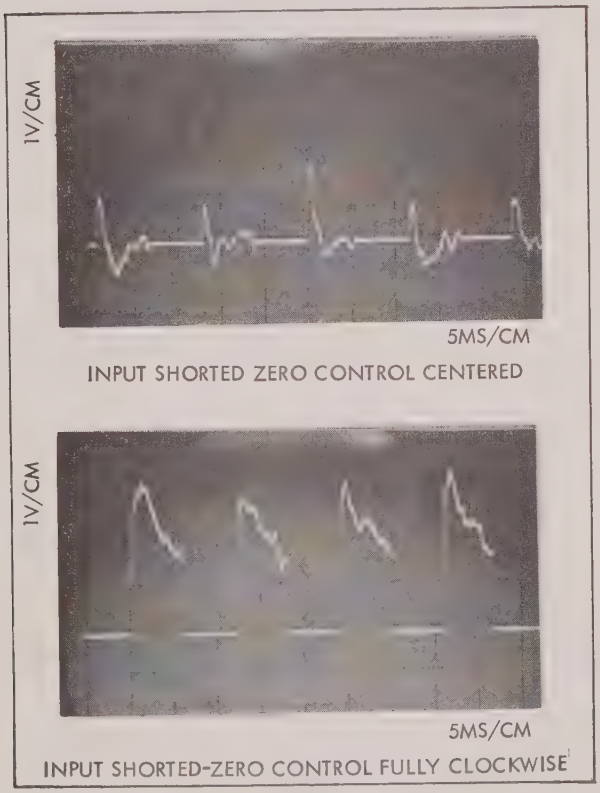


Figure 4-6. WAVEFORMS AT TP6

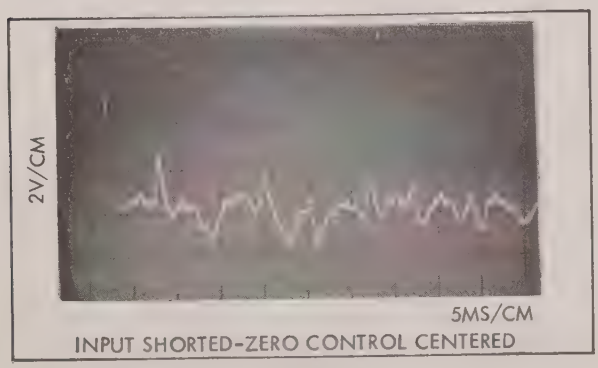


Figure 4-7. WAVEFORM AT TP7

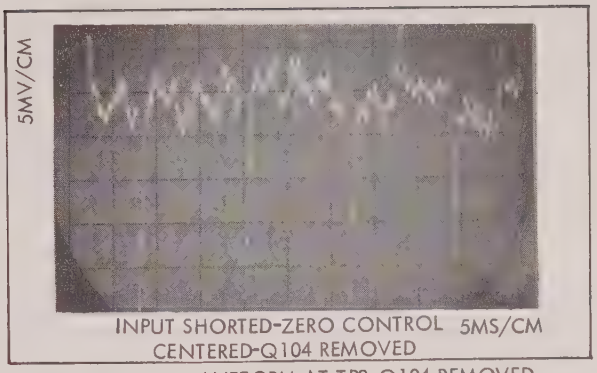


Figure 4-8. WAVEFORM AT TP2-Q104 REMOVED

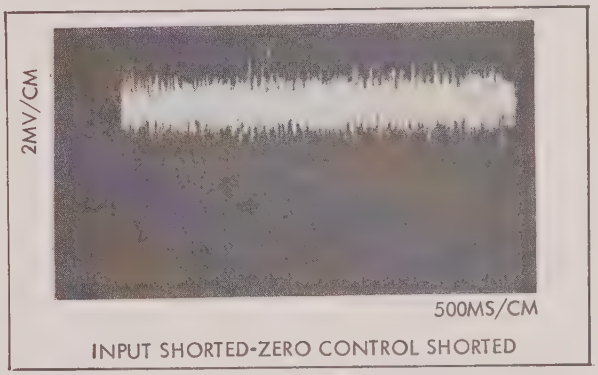


Figure 4-9. WAVEFORM AT TP2

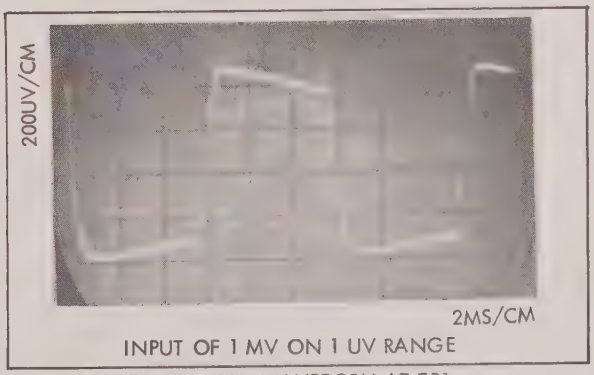


Figure 4-10. WAVEFORM AT TP1

c. Cracks, cuts, and other damage to the polyethelene grommets or to the circuit boards.

CAUTION!

Do not touch the polyethelene grommets. Contamination will cause excessive electrical leakage.

4-18. PERIODIC MAINTENANCE

4-19. Periodic maintenance consists of occasional cleaning to remove dust, grease, and other contaminations.

4-20. To clean the instrument proceed as follows:

a. Remove accumulations of dust and other foreign matter with low-pressure, clean dry air.

b. Clean binding posts and front panel with denatured alcohol, using a clean cloth or cotton swab. Do not attempt to clean switches.

4-21. LEAKAGE RESISTANCE TEST

4-22. The following leakage test is to be used to check the leakage resistance of the Model 845. Failure of the instrument to meet the test indicates the need of cleaning or troubleshooting.

a. Connect the equipment as illustrated in Figure 4-11.

b. Place the Model 845 controls as follows:

POWER	ON/LINE OPR or BAT OPR
OPR	OPR
RANGE	300 MICROVOLTS

c. For a leakage resistance of 10^{12} ohms, the panel meter must not indicate more than 100 microvolts. Allow sufficient time for the meter deflection to stabilize.

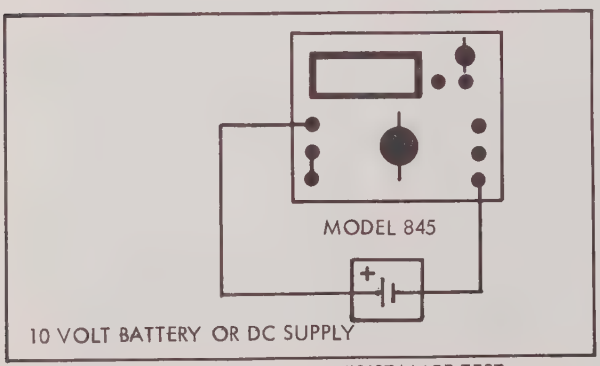


Figure 4-11. LEAKAGE RESISTANCE TEST EQUIPMENT CONNECTIONS

4-23. CALIBRATION PROCEDURES

4-24. The Model 845 should be calibrated once every year. It is recommended that if component replacement is performed, the Model 845 should be re-calibrated. Test and alignment points are illustrated by Figure 4-12.

4-25. METER CALIBRATION

4-26. Connect the equipment as illustrated in Figure 4-13 and proceed as follows:

Note!

Allow equipment to warm up for at least 5 minutes.

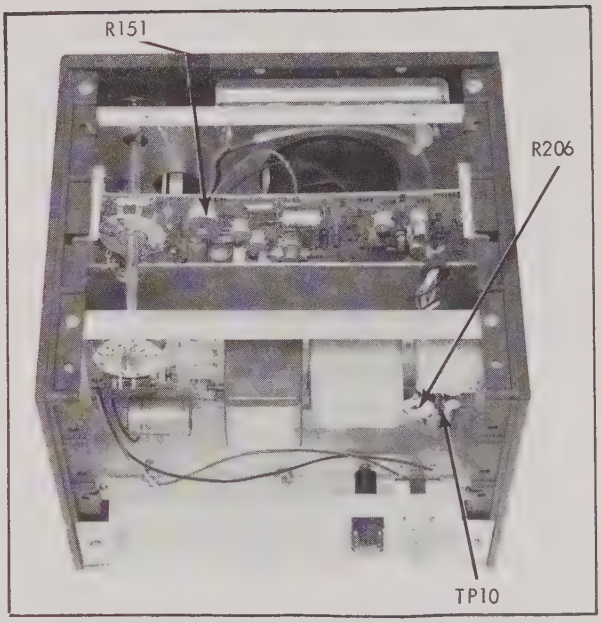


Figure 4-12. TEST AND ALIGNMENT POINTS

a. Place the Model 845 controls as follows:

POWER	ON/LINE OPR or BAT OPR
OPR	OPR
RANGE	10 VOLTS

b. Adjust the Model 332A output for 10 volts dc.

c. Adjust R151 for a full-scale deflection (+10) on the Model 845 meter.

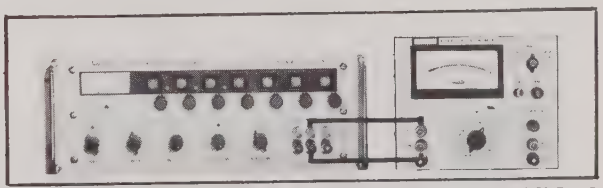


Figure 4-13. CALIBRATION EQUIPMENT CONNECTIONS

4-27. CHOPPER FREQUENCY

4-28. To adjust the 84 Hz multivibrator frequency, proceed as follows:

a. Place the Model 845 POWER switch to ON/LINE OPR or BAT OPR.

b. Connect an oscilloscope between TP10 and ground.

c. Adjust R206 until the oscilloscope waveform has a time period of 12 milliseconds, as illustrated in Figure 4-5.

Note!

A frequency counter may be used in lieu of the oscilloscope for adjustment of the 84 Hz multivibrator frequency.

SECTION V

LIST OF REPLACEABLE PARTS

5-1. INTRODUCTION

5-2. This section contains complete descriptions of those parts one might normally expect to replace during the life of the instrument. The first listing is a breakdown of all of the major assemblies in the instrument. Subsequent listings itemize the components in each assembly. Every listing where possible, is accompanied by an illustration identifying each component in the listing. Assemblies and subassemblies are identified by a reference designation beginning with the letter A, (e.g., A1, A2, A3, etc.). Components are identified by the schematic diagram reference designation (e.g. R1, C107, DS1). Parts not appearing on the schematic diagram are identified by only a location index number. Flagnotes are used throughout the parts list and refer to ordering explanations. The flagnote explanations appear at the end of the parts list.

5-3. COLUMNAR INFORMATION

a. The REF DESIG column indexes the item description to the associated illustration. In general the reference designations are listed in alpha-numeric order. Subassemblies of minor proportions are sometimes listed with the assembly of which they are a part. In this case, the reference designations for the components of the subassembly may appear out of order.

b. The INDEX NO. column lists coordinates which locate the designated part on the associated illustration.

c. The DESCRIPTION column describes the salient characteristics of the component. Indention of the item description indicates the relationship to other assemblies, components, etc. In many cases it is necessary to abbreviate in this column. For abbreviations and symbols used, see paragraph 5-7.

d. The ten-digit part number by which the item is identified at the John Fluke Mfg. Co. is listed in the STOCK NO column. Use this number when ordering parts from the factory or authorized representatives.

e. The Federal Supply Code for the item manufacturer is listed in the MFR column. An abbreviated list of Federal Supply Codes is included in the Appendix.

f. The part number which uniquely identifies the item to the original manufacturer is listed in the MFR PART NO column. If a component must be ordered by description, the type number is listed.

g. The TOT QTY column lists the total quantity of the item used in the instrument. Second and subsequent listing of the same item are referenced to the first listing with the abbreviation REF. In the case of optional subassemblies, plug ins, etc. that are not always part of the instrument, the TOT QTY column lists the total quantity of the item in that particular assembly.

h. Entries in the REC QTY column indicate the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one of every part in the instrument be stocked.

i. The USE CODE column identifies certain parts which have been added, deleted or modified throughout the life of the instrument. Each part for which a Use Code has been assigned may be identified with a particular instrument serial number by consulting the Serial Number Effectivity List at the end of the parts list. As Use Codes are added to the list, the TOT QTY column listings are changed to reflect the most current information. Sometimes when a part is changed, the new part can and should be used as a replacement for the original part. In this event a parenthetical note is added in the DESCRIPTION column.

5-4. HOW TO OBTAIN PARTS

5-5. Standard components have been used wherever possible. Standard components may be ordered directly from the manufacturer by using the manufacturer's part number, or parts may be ordered from the John Fluke Mfg. Co. factory or authorized representative by using the Fluke part number. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. You can insure prompt and efficient handling of your order to the John Fluke Mfg. Co. if you include the following information:

a. Instrument model and serial number.

b. Component description.

c. Component reference designation.

d. John Fluke Mfg. Co. part number.

If you must order structural parts not listed in the parts list, describe the part as completely as possible. A sketch of the part showing its location to other parts of the instrument is usually most helpful.

5-7. LIST OF ABBREVIATIONS

ac	alternating current
Al	Aluminum
amp	ampere
assy	assembly
cap	capacitor
car flm	carbon film
C	centigrade
cer	ceramic
comp	composition
conn	connector
db	decibel
dc	direct current
dpdt	double-pole, double-throw
dpst	double-pole, single-throw
elect	electrolytic
F	fahrenheit
Ge	germanium
gmv	guaranteed minimum value
h	henry
Hz	hertz
hf	high frequency
IC	integrated circuit
if	intermediate frequency
k	kilohm
kHz	kilohertz
kv	kilovolt
lf	low frequency
MHz	megahertz
M	megohm
met flm	metal film
ua	microampere
uf	microfarad
uh	microhenry
usec	microsecond
uv	microvolt
ma	milliampere
mh	millihenry
m	millohms
msec	millisecond
mv	millivolt
mw	milliwatt
na	nanoampere
nsec	nanosecond
nv	nanovolt
Ω	ohm
ppm	parts per million
piv	peak inverse voltage
p-p	peak to peak
pf	picofarad
plstc	plastic
p	pole
pos	position
P/C	printed circuit
rf	radio frequency
rfi	radio frequency interference
res	resistor
rms	root mean square
rtry	rotary
sec	second
sect	section
S/N	serial number
Si	silicon
scr	silcon controlled rectifier
spdt	single-pole, double-throw
spst	single-pole, single-throw
sw	switch
Ta	tantalum
tstr	transistor
tvm	transistor voltmeter
uhf	ultr high frequency
vtvm	vacuum tube voltmeter
var	variable
vhf	very high frequency
vlf	very low frequency
v	volt
va	voltampere
vac	volts, alternating current
vdc	volts, direct current
w	watt
ww	wire wound

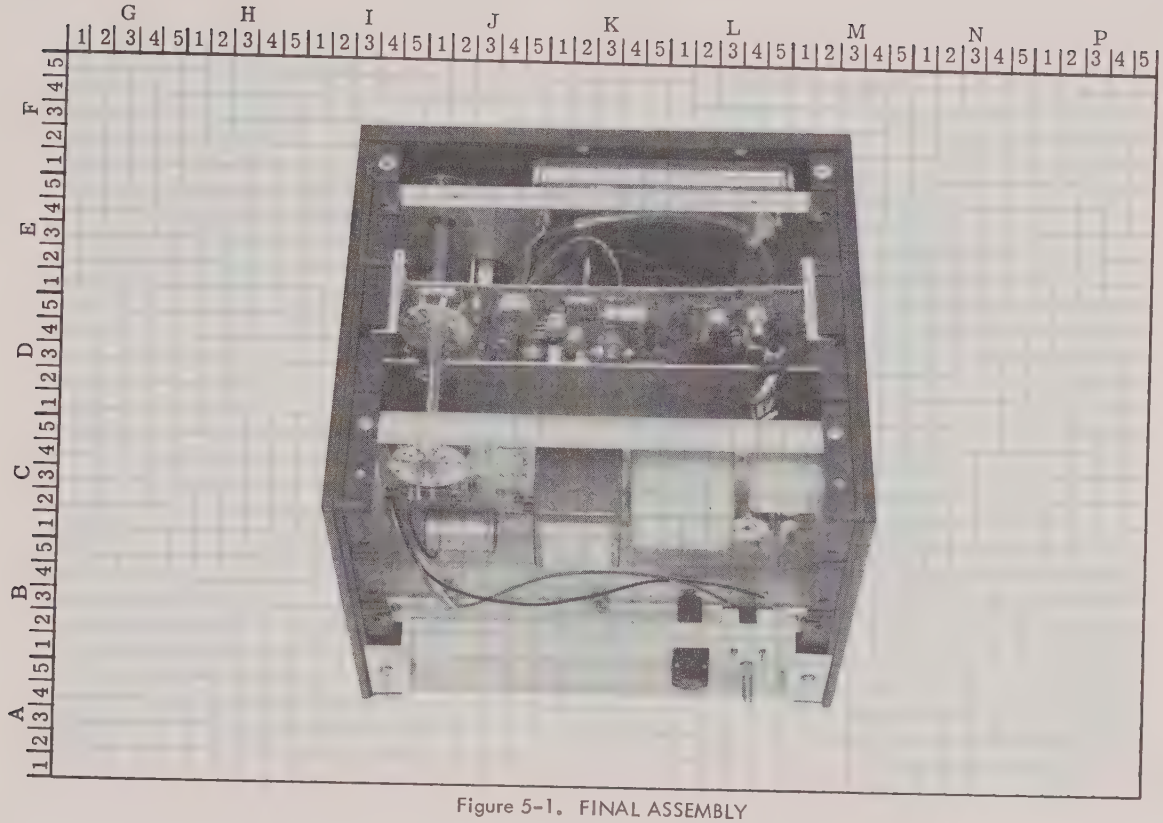


Figure 5-1. FINAL ASSEMBLY

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
		FINAL ASSEMBLY - Figure 5 - 1						
		Line-powered model	845A					
		Battery/line-powered model	845AB					
A1	D3-M3	Chassis Assembly (See Figure 5-2)						
A2	F1-J4	Front Panel Assembly (See Figure 5-3)						
A3	D5-L1	Amplifier P/C Assembly (See Figure 5-4)	1702-194399 (845A-401)	89536	1702-194399	1		
A4	C4-J4	Power Supply P/C Assembly (See Figure 5-5)						
		Model 845A	1702-194407 (845A-402)	89536	1702-194407	1		
		Model 845AB	1702-194555 (845AB-402)	89536	1702-194555	1		

Figure 5-2. CHASSIS ASSEMBLY

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
A1		CHASSIS ASSEMBLY - Figure 5-2						
BT201		Battery, 1.2v, Ni-Cad, (not illustrated)	4002-160390	05397	N53T	8		
F1		Fuse, Type MDL, slow blow, 1/16 amp, 250v (for 115v operation) (not illustrated)	5101-163030	71400	Type MDL	1		
F1		Fuse, Type MDL, slow blow, 1/32 amp, 250v (for 230v operation) (not illustrated)	5101-163022	71400	Type MDL	1		
P1	C5-S5	Connector, male, 3 prong, chassis mount	2109-160275	73586	M-1548-GS	1		
XBT201		Holder, battery (not illustrated)	3155-194530	89536	3155-194530	1		
XF1	C5-S2	Holder, fuse	2102-160846	75915	342004	1		
		Coupler, 1/4 to 1/4 (not illustrated)	2402-104505	89536	2402-104505	1		
		Coupler, 1/8 to 1/4 (not illustrated)	2402-193557	89536	2402-193557	1		
	C1-R3	Cover, bottom	3156-194233	89536	3156-194233	1		
	I2-P2	Cover, side	3156-194290	89536	3156-194290	2		
		Cover, side (not illustrated)	3156-194290	89536	3156-194290	REF		
	I2-P5	Cover, side front	3156-162164	89536	3156-162164	2		
		Cover, side front (not illustrated)	3156-162164	89536	3156-162164	REF		
	K2-Q2	Cover, top	3156-194225	89536	3156-194225	1		
	B5-Q1	Foot, rubber	2819-103309	77969	9102-W	4		
	B1-Q2	Foot, rubber	2819-103309	77969	9102-W	REF		
	B5-S5	Foot, rubber	2819-103309	77969	9102-W	REF		
	B1-S4	Foot, rubber	2819-103309	77969	9102-W	REF		
	K3-R2	Handle, black vinyl	2404-166280	12136	919-415-173	1		
		Line cord (not illustrated)	6005-161638	91934	107-1, SVT	1		
		Shaft, zero (not illustrated)	3156-194365	89536	3156-194365	1		
		Shaft, range switch (not illustrated)	2814-203299	89536	2814-203299	1		
	B3-R3	Tilt stand	3156-194282	89536	3156-194282	1		

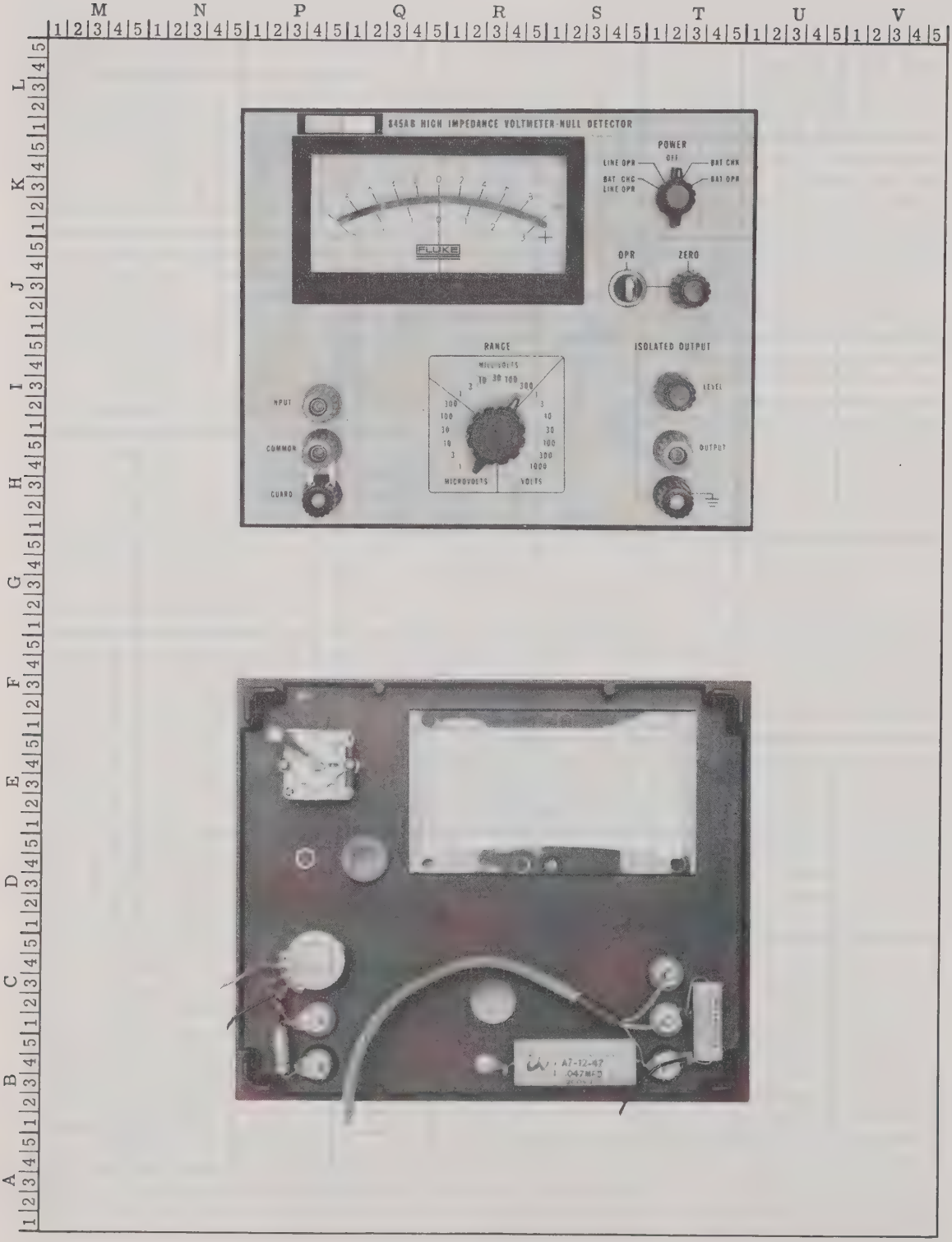


Figure 5-3. FRONT PANEL ASSEMBLY

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
A2		**FRONT PANEL ASSEMBLY** Figure 5-3						
C1	C1-T4	Cap, mylar, 0.047 uf ±20%, 1200v	1507-182683	72928	343-087M	1		
C2	B4-S3	Cap, poly, 0.047 uf ±20%, 1200v	1507-190561	84411	JF-7	1		
C3	B5-P3	Cap, elect, 10 uf +50/-10%, 25v	1502-170266	73445	C426ARF10	1		
J1	I2-P4	Binding post, red	2811-149856	58474	BHB-10208-G22	2		
J2	H5-P4	Binding post, red	2811-149856	58474	BHB-10208-G22	REF		
J3	H2-P4	Binding post, black	2811-142984	58474	DF31BC	2		
J4	H5-T2	Binding post, red	2811-142976	58474	DF31RC	1		
J5	H3-T2	Binding post, black	2811-142984	58474	DF31BC	REF		
M1	K2-Q2	Meter, 100-0-100 ua, 650Ω	2901-192294	80145	502	1		
R1	C4-P4	Res, var, comp, 10k ±30%, 1/3w	4701-192344	71450	WF-45	1		
R2	C2-P2	Res, comp, 4.7k ±10%, 1/2w	4704-108381	01121	EB4721	1		
S201	E3-P3	Switch, detent, dual index ball (845A only)	5108-193573	76854	Type F	1		
S201	E3-P3	Switch, detent, dual index ball (845AB only)	5108-193565	76854	Type F	1		
	I3-T2	Knob, LEVEL	2405-158949	89536	2405-158949	2		
	K3-T2	Knob, POWER	2405-158956	89536	2405-158956	1		
	I1-R3	Knob, RANGE	2405-170035	89536	2405-170035	1		
	J3-T3	Knob, ZERO	2405-158949	89536	2405-158949	REF		
	I5-P4	Panel, front (845A only)	1406-194209	89536	1406-194209	1		
	I5-P4	Panel, front (845AB only)	1406-194522	89536	1406-194522	1		
	H4-P5	Shorting link	2811-190728	24655	938LG	1		

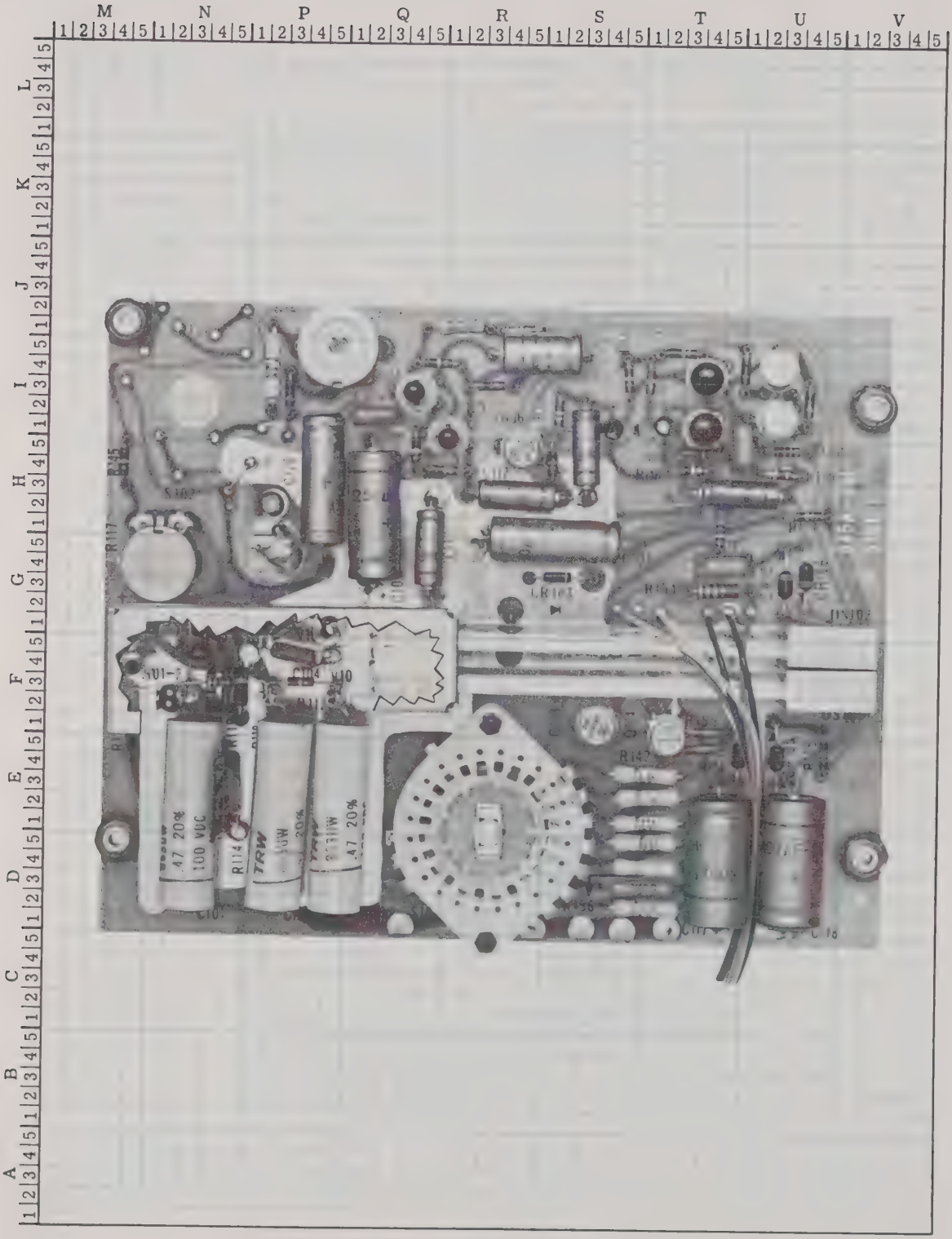


Figure 5-4. AMPLIFIER P/C ASSEMBLY (SHEET 1 OF 2)

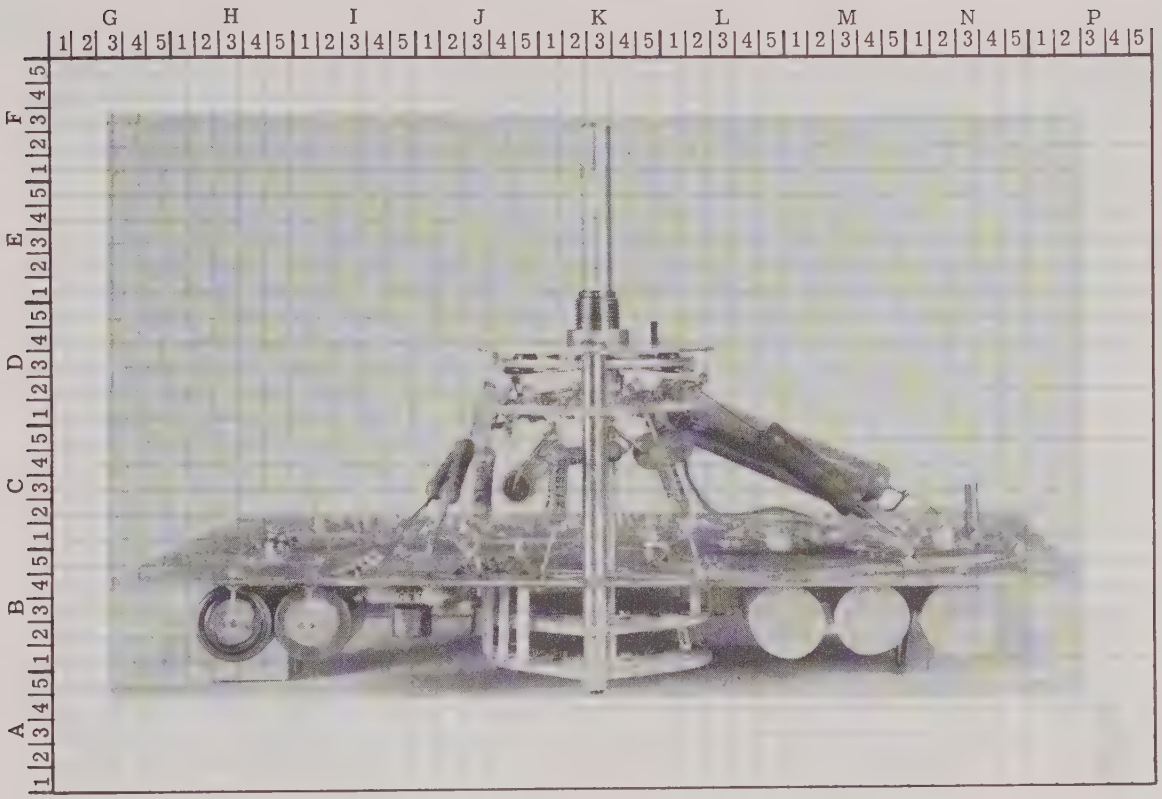


Figure 5-4. AMPLIFIER P/C ASSEMBLY (SHEET 2 OF 2)

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
A3		**AMPLIFIER P/C ASSEMBLY** **Figure 5-4**	1702-194399 (845A-401)	89536	1702-194399	REF		
C101	E1-N3	Cap, plstc, 0.47 uf ±20%, 100v	1507-190553	84411	JF-36	3		
C102	E1-P2	Cap, plstc, 0.47 uf ±20%, 100v	1507-190553	84411	JF-36	REF		
C103	E1-P5	Cap, plstc, 0.47 uf ±20%, 100v	1507-190553	84411	JF-36	REF		
C104	F5-P3	Cap, plstc, 0.1 uf ±20%, 250v	1507-161992	73445	C280AE/P100K	3		
C105	G1-P3	Cap, cer, 300 pf ±10%, 500v	1501-105734	71590	BB60301KW7W	2		
C106	H1-Q2	Cap, elect, 1250 uf +50/-10%, 4v	1502-166330	73445	C437ARB1250	1		
C107	G5-S1	Cap, elect, 250 uf +50/-10%, 16	1502-187765	73445	C437ARE250	2		
C108	G1-N4	Cap, cer, 300 pf ±10%, 500v (underneath cover)	1501-105734	71590	BB60301KW7W	REF		
C109	I2-Q2	Cap, plstc 0.1 uf ±20%, 250v	1507-161992	73445	C280AE/P100K	REF		
C110	G5-Q5	Cap, elect, 10 uf +50/-10%, 25v	1502-170266	73445	C426ARF10	2		
C111	J1-R1	Cap, mylar, 0.0047 uf ±20%, 200v	1507-106054	72928	C472M	1		
C112	H3-R4	Cap, elect, 10 uf +50/-10%, 25v	1502-170266	73445	C426ARF10	REF		
C113	I5-S1	Cap, elect, 400 uf +50/-10%, 4v	1502-187773	73445	C426ARE400	2		
C114	H5-S3	Cap, Ta, 10 uf ±10%, 20v	1508-160259	05397	K10C20K	1		
C115	H5-U1	Cap, plstc, 0.1 uf ±20%, 250v	1507-161992	73445	C280AE/P100K	REF		
C116	H3-T5	Cap, Ta, 22 uf ±10%, 15v	1508-182816	05397	K22C15K	1		
C117	D5-T5	Cap, elect, 400 uf +50/-10%, 25v	1502-168153	73445	C437ARF400	3		
C118	D5-U3	Cap, elect, 400 uf +50/-10%, 25v	1502-168153	73445	C437ARF400	REF		
C119	G4-T5	Cap, plstc, 0.22 uf ±20%, 230v	1507-194803	73445	C280AE/P220K	1		

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
C120	H4-P4	Cap, elect, 250 uf +50/-10%, 16v	1502-187765	73445	C437ARE250	REF		
CR101		Diode, C.D. Type CD12599 treated (not illustrated)	4802-180885	89536	4802-180885	2		
CR102		Diode, C.D. Type CD12599 treated (not illustrated)	4802-180885	89536	4802-180885	REF		
CR103	G4-S1	Diode, zener, 10v Type 1N961A	4803-113324	07910	1N961A	1		
CR104	E5-T5	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	8		
CR105	E5-U3	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR106	G4-U4	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR107	G3-U3	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
DS101		Lamp, neon, NE-2U (not illustrated)	3902-162602	89730	NE-2U	2		
DS102		Lamp, neon, NE-2U (not illustrated)	3902-162602	89730	NE-2U	REF		
Q101	F5-P1	Tstr, selected Transitron Type ST-1750T	4805-194456	89536	4805-194456	1		
Q102	G1-N2	Tstr, selected Transitron Type ST-1750T	4805-198812	89536	4805-198812	1		
Q103	F5-N3	Tstr, Type 2N3391	4805-168708	89730	2N3391	3		
Q104	I3-Q4	Tstr, Type 2N3565	4805-177105	07263	2N3565	2		
Q105	I1-R1	Tstr, Type 2N3565	4805-177105	07263	2N3565	REF		
Q106	H5-R4	Tstr, T.I. Type GA2877	4805-182709	01295	GA2877	2		
Q107	I1-S4	Tstr, Type 2N3391	4805-168708	89730	2N3391	REF		
Q108	I1-T2	Tstr, Type 2N3391	4805-168708	89730	2N3391	REF		
Q109	I4-T4	Tstr, Motorola Type MPS3638	4805-169375	04713	MPS3638	2		
Q110	I1-T4	Tstr, Motorola Type MPS3638	4805-169375	04713	MPS3638	REF		
Q111	I4-U2	Tstr, Type 2N1304	4805-117127	01295	2N1304	1		
Q112	I2-U2	Tstr, Type 2N1305	4805-190298	95303	2N1305	1		
Q113	F1-S3	Tstr, T.I. Type GA2875	4805-182691	01295	GA2875	3		
Q114	F1-T2	Tstr, T.I. Type GA2877	4805-182709	01295	GA2877	REF		
R101	C5-L1	Res, car flm, matched set (sheet 2 of 2)	1					
R102	C4-K2	Res, car flm, 900k±1/2%, 1/2w (Sheet 2 of 2)	4703-107391	19701	DC1/2A	1		
R103	C3-J5	Res, car flm, matched set (sheet 2 of 2)	1					
R104	C3-M2	Res, car flm, 10M ±1/2%, 1w (sheet 2 of 2)	4703-107748	19701	DC1	1		
R105	C3-L1	Res, car flm, matched set (sheet 2 of 2)	1					
R106	C2-K1	Res, car flm, matched set (sheet 2 of 2)	1					
R107	C3-J3	Res, car flm, matched set (sheet 2 of 2)	1					
R108	C3-J2	Res, car flm, matched set (sheet 2 of 2)	1					
R109	C3-J1	Res, car flm, matched set (sheet 2 of 2)	1					
R110	C5-L3	Res, car flm, 300k ±1%, 2w (sheet 2 of 2)	4703-107425	12400	Type C30	2		
R111	F3-N4	Res, comp, 47k ±5%, 1/4w	4704-148163	01121	CB4735	2		
R112	F3-P3	Res, comp, 100k ±5%, 1/4w	4704-148189	01121	CB1045	4		
R113	E5-M5	Res, comp, 470Ω ±5%, 1/4w	4704-147983	01121	CB4715	1		

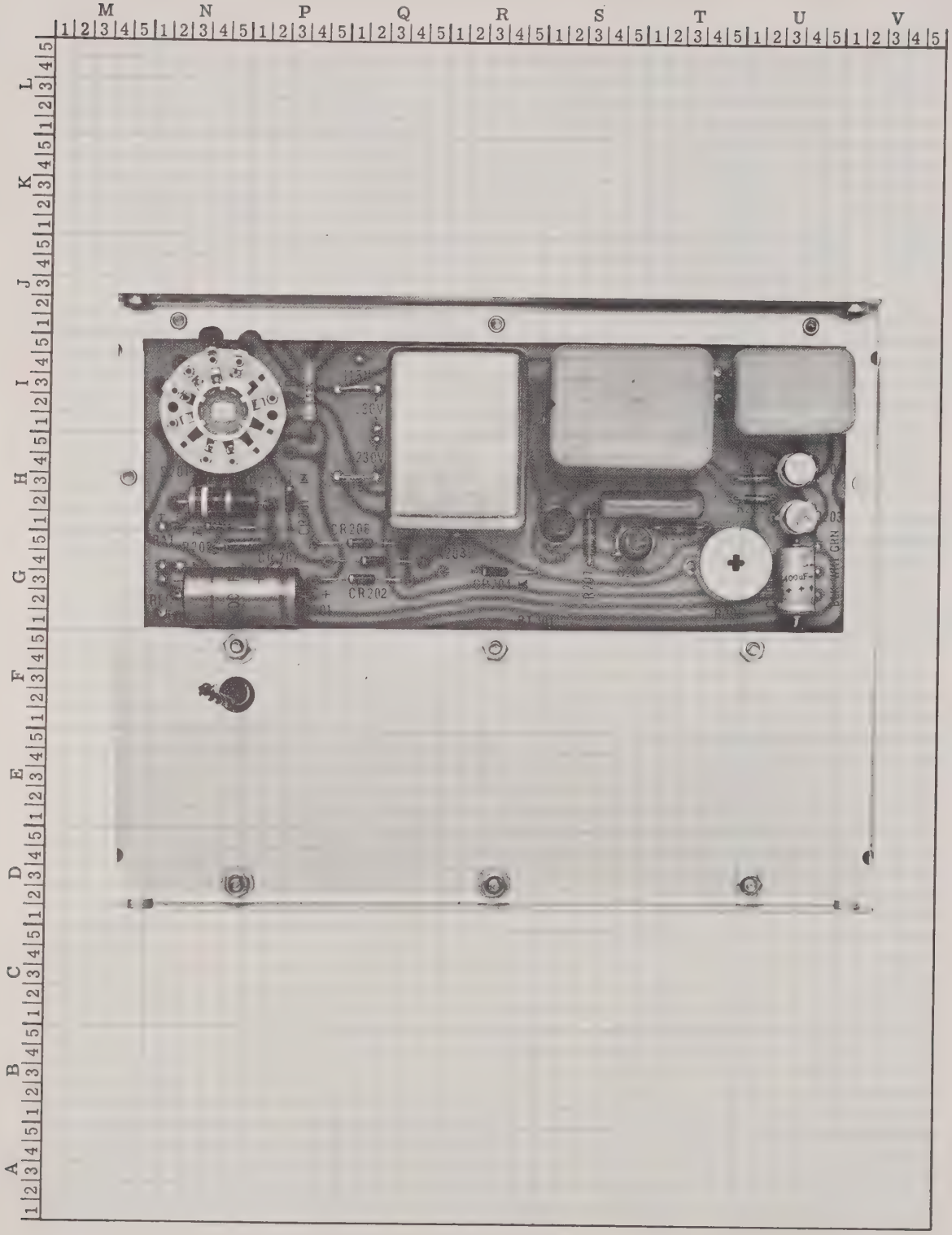
REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
R114	E1-N5	Res, ww, 10Ω ±1%, 1/2w	4707-193946	19429	4707-193946	1		
R115	G1-P1	Res, comp, 1.2M ±10%, 1/2w (underneath cover)	4704-108407	01121	EB1251	1		
R116	F3-M4	Res, comp, 680k ±5%, 1/4w (underneath cover)	4704-188433	01121	CB6845	1		
R117	G4-N1	Res, var, comp, 5M ±30%, 0.2w	4701-193086	71450	U-70	1		
R118	F3-P1	Res, comp, 10M ±10%, 1/2w	4704-108142	01121	EB1061	1		
R119	F3-N5	Res, comp, 2.2M ±10%, 1/4w	4704-198390	01121	CB2255	1		
R120	F2-N4	Res, comp 47k ±5%, 1/4w	4704-148163	01121	CB4735	REF		
R121	E4-R1	Res, comp, 10Ω ±5%, 1/4w (underneath switch wafers)	4704-147868	01121	CB1005	1		
R122	G1-R4	Res, comp, 68k ±5%, 1/4w	4704-148171	01121	CB6835	2		
R123	H1-T4	Res, comp, 82k ±5%, 1/4w	4704-188458	01121	CB8235	1		
R124	E2-Q5	Res, comp, 22Ω ±5%, 1/4w (underneath switch wafers)	4704-147884	01121	CB2205	1		
R125	E1-Q4	Res, comp, 68Ω ±5%, 1/4w (underneath switch wafers)	4704-147918	01121	CB6805	1		
R126	D5-Q4	Res, comp, 220Ω ±5%, 1/4w (underneath switch wafers)	4704-147959	01121	CB2215	1		
R127	H2-U4	Res, comp, 10k ±5%, 1/4w	4704-148106	01121	CB1035	2		
R128	H5-Q4	Res, comp, 100k ±5%, 1/4w	4704-148189	01121	CB1045	REF		
R129	H4-R1	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	7		
R130	I4-Q5	Res, comp, 100k ±5%, 1/4w	4704-148189	01121	CB1045	REF		
R131	I3-R3	Res, comp, 100Ω ±5%, 1/4w	4704-147926	01121	CB1015	1		
R132	J1-R4	Res, comp, 39k ±5%, 1/4w	4704-188466	01121	CB3935	1		
R133	H5-S1	Res, comp, 10k ±5%, 1/4w	4704-148106	01121	CB1035	REF		
R134	I2-S1	Res, comp, 15k ±5%, 1/4w	4704-148114	01121	CB1535	2		
R135	E5-U5	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
R136	D2-T1	Res, met flm, 1.07k ±1%, 1/2w	4705-187930	12400	Type CEC-TO	1		
R137	D3-T1	Res, met flm, 3.16k ±1%, 1/2w	4705-187781	12400	Type CEC-TO	1		
R138	D4-T1	Res, met flm, matched set	2					
R139	D5-T1	Res, met flm, matched set	2					
R140	E1-T1	Res, met flm, matched set	2					
R141	E2-T1	Res, met flm, matched set	2					
R142	E4-T1	Res, met flm, matched set	2					
R143	I4-S5	Res, comp, 150k ±5%, 1/4w	4704-182212	01121	CB1545	3		
R144	I4-T1	Res, comp, 150k ±5%, 1/4w	4704-182212	01121	CB1545	REF		
R145	H4-M4	Res, comp, 150k ±5%, 1/4w	4704-182212	01121	CB1545	REF		
R146	H4-T3	Res, comp, 100k ±5%, 1/4w	4704-148189	01121	CB1045	REF		
R147	H5-T4	Res, comp, 15k ±5%, 1/4w	4704-148114	01121	CB1535	REF		
R148	I5-T3	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
R149	H4-U3	Res, comp, 3.9M ±5%, 1/4w	4704-188417	01121	CB3955	1		
R150	H5-U3	Res, comp, 68k ±5%, 1/4w	4704-148171	01121	CB6835	REF		
R151	J1-P5	Res, var, ww, 2k ±5%, 1-1/4w	4702-160705	11237	Type 110	2		
R152	I4-P2	Res, met flm, 7.5k ±1%, 1/2w	4705-192161	12400	Type CEC-TO	1		
R153	I3-P3	Res, comp, 1k ±5%, 1/4w	4704-148073	01121	CB1025	3		
R154	G3-T4	Res, comp, 33k ±5%, 1/2w	4704-108761	01121	EB3335	1		

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
R155	F1-T4	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
R156	E5-T4	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
R157		Res, met flm, 825Ω ±1%, 1/2w (not illustrated)	4705-155119	19701	MF7C-TO	1		
R158	I4-U1	Res, comp, 1k ±5%, 1/4w	4704-148023	01121	CB1025	REF		
R159	I3-U4	Res, comp, 1k ±5%, 1/4w	4704-148023	01121	CB1025	REF		
S101	D4-K3	Switch, rotary, 4p, 19 pos, 3 sect (sheet 2 of 2)	5105-194589	89536	5105-194589	1		
S102		Switch, section (not illustrated)	5107-194027	76854	Type FV	1		
S103	G5-P2	Switch, twist, spdt	5105-194936	89536	5105-194936	1		
V101, V102	F4-Q3	Photocell assembly	3700-194449	89536	3700-194449	1		
	J2-M4	Grommet, 3/8"	2807-171876	89536	2807-171876	4		
	E1-M4	Grommet, 3/8"	2807-171876	89536	2807-171876	REF		
	I3-V3	Grommet, 3/8"	2807-171876	89536	2807-171876	REF		
	D5-V3	Grommet, 3/8"	2807-171876	89536	2807-171876	REF		
	F3-S1	Rod, optical	3800-168047	89536	3800-168047	2		
	F5-S1	Rod, optical	3800-168047	89536	3800-168047	REF		

These resistors are factory matched. If any replacement is required, an entire set, part number 4710-194415, must be ordered.

These resistors are factory matched. If any replacement is required, an entire set, part number 4710-194423, must be ordered.

REF DESIG	INDEX NO	DESCRIPTION	STOCK NO	MFR	MFR PART NO	TOT QTY	REC QTY	USE CODE
A4		**POWER SUPPLY P/C ASSEMBLY**						
		Figure 5-5						
		Model 845A	1702-194407 (845A-402)	89536	1702-194407	REF		
		Model 845AB	1702-194555 (845AB-402)	89536	1702-194555	REF		
C201	G2-N5	Cap, elect, 400 uf +50/-10%, 25v	1502-168153	73445	C437ARF400	REF		
C203	H2-T1	Cap, plstc, 1 uf ±20%, 250v	1507-190330	73445	C280AE/P1M	1		
C204	G4-U3	Cap, elect, 400 uf +50/-10%, 4v	1502-187773	73445	C426ARE400	REF		
CR201	H2-P3	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR202	G3-Q1	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR203	G4-Q2	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR204	G4-R3	Diode, IRC Type 4D4	4802-180240	81483	Type 4D4	REF		
CR205	H1-N4	Diode, IRC Type 4D4 (845AB only)	4802-180240	81483	Type 4D4	2		
CR206	G5-Q1	Diode, IRC Type 4D4 (845AB only)	4802-180240	81483	Type 4D4	REF		
CR207		Diode, Type 1N961A (845A only) (not illustrated)	4803-113324	07910	1N961A	1		
Q201	H1-S1	Tstr, T.I. Type GA2817	4805-182600	01295	GA2817	2		
Q202	G5-S5	Tstr, T.I. Type GA2817	4805-182600	01295	GA2817	REF		
Q203	H2-U4	Tstr, T.I. Type GA2875	4805-182691	01295	GA2875	REF		
Q204	H4-U3	Tstr, T.I. Type GA2875	4805-182691	01295	GA2875	REF		
R201	H2-N4	Res, comp, 39Ω ±10%, 2w (845AB only)	4704-144378	01121	HB3901	1		
R202	G5-N5	Res, comp, 150Ω ±5%, 1w	4704-178566	01121	GB1515	1		
R205	I3-P4	Res, met flm, 9.53k ±1%, 1/2w (845AB only)	4705-159442	12400	Type CEC-TO	1		
R206	G4-T5	Res, var, ww, 2k ±5%, 1-1/4w	4702-160705	11237	Type 110	REF		
R207	H1-S3	Res, comp, 5.1k ±5%, 1/2w	4704-109108	01121	EB5125	2		
R208	H1-T2	Res, comp, 5.1k ±5%, 1/2w	4704-109108	01121	EB5125	REF		
R209	H3-U1	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
R210	H4-U1	Res, comp, 22k ±5%, 1/4w	4704-148130	01121	CB2235	REF		
S201	H5-N3	Switch section (845A only)	5107-194035	76854	Type F	1		
S201	H5-N3	Switch section (845AB only)	5107-194019	76854	Type FE	1		
T201	H5-R1	Transformer, power	5600-192724	89536	5600-192724	1		
T202	I2-S4	Transformer, drive	5600-192708	89536	5600-192708	1		
T203	I3-U3	Transformer, isolation	5600-192716	89536	5600-192716	1		


M N P Q R S T U V
A B C D E F G H I J K L
CR206
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C201
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R240

5-8 SERIAL NUMBER EFFECTIVITY

5-9. A Use Code column is provided to identify certain parts that have been added, deleted, or modified during production of the Model 845. Each part for which a use code has been assigned may be identified with a particular instrument serial number by consulting the Use Code Effectivity List below. All parts with no code are used on all instruments with serial numbers above 123. New codes will be added as required by instrument changes.

USE CODE	EFFECTIVITY
No Code	Model 845A and 845AB, serial number 123 and on

APPENDIX A

FEDERAL SUPPLY CODE FOR MANUFACTURERS

A-1. CODE TO NAME

A-2. The following five-digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name. Suppliers not listed in the Federal Supply Code for Manufacturers have been assigned an alphabetical code by FLUKE.

00213	Sage Electronics Corp. Rochester, New York
00327	Welwyn International, Inc. Cleveland, Ohio
00656	Aerovox Corp. New Bedford, Massachusetts
01121	Allen-Bradley Company Milwaukee, Wisconsin
01281	Pacific Semiconductors Inc. Lawndale, California
01295	Texas Instruments, Inc. Semiconductor Components Div. Houston, Texas
01730	Circle Mfg. Co. Inc. Little Falls, New Jersey
01884	Dearborn Electronic Labs Inc. Orlando, Florida
01963	Cherry Electrical Products Corp. Highland Park, Illinois
02660	Amphenol-Borg Elect. Corp. Chicago, Illinois
02606	Fenwal Laboratories Inc. Framington, Massachusetts
02799	Arco Capacitors, Inc. Los Angeles, California
03614	Bussmann Mfg. Div. of McGraw-Edison Co. Los Angeles, California
03615	Ohmite Mfg. Co. Los Angeles, California
03877	Transitron Electronic Corp. Wakefield, Massachusetts
03911	Clairex Corp. New York, New York
03980	Muirhead Instruments, Inc. Mountainside, New Jersey
04009	Arrow Hart and Hegemen Electronic Company Hartford, Connecticut
04062	Elmenco Products Company New York, New York
04202	Winchester Electronics Co. New Milford, Connecticut
04221	Telex-Aemco Division of Telex Corp. Mankato, Minnesota
04645	Kurz-Kasch, Inc. Chicago, Illinois
04713	Motorola Inc. Semiconductor Products Division Phoenix, Arizona
05082	Tung-Sol Electric Inc. Melrose Park, Illinois
05278	Penn-East Engrg. Corp. Kutztown, Pennsylvania
05397	Union Carbide Corp. Linde Division Kemet Dept. Cleveland, Ohio
05571	Sprague Electric Company Culver City, California
05704	Alac, Inc. Glendale, California
06001	General Electric Company Capacitor Department Irmo, South Carolina
06136	Ward Leonard Electric Co. Los Angeles, California
06473	Amphenol Space and Missile Sys Chatsworth, California
06555	Beede Electrical Inst. Co. Penacook, New Hampshire
06751	Nuclear Corporation of America, Inc. U. S. Semcor Div. Phoenix, Arizona
06860	Gould National Batteries Inc. La Puente, California
07115	Corning Glass Works Electronic Components Dept. Bradford, Pennsylvania
07263	Fairchild Semiconductor Div. of Fairchild Camera and Instrument Corp. Mountain View, California
07344	Bircher Co., Inc. Rochester, New York
07792	Lerma Engineering Corp. Northampton, Massachusetts
07910	Continental Device Corp. Hawthorne, California
08530	Reliance Mica Corp. Brooklyn, New York
08863	Nylomatic Corp. Morrisville, Pennsylvania
08988	Skottie Electronics Inc. Peckville, Pennsylvania
11237	Chicago Telephone of Calif Inc. South Pasadena, California
11503	Keystone Mfg. Co. Warren, Michigan
12060	Diodes, Inc. Chatsworth, California
12136	Philadelphia Handle Co. Camden, New Jersey
12400	International Resistance Co. Control Components Division Philadelphia, Pennsylvania
12617	Hamlin Inc. Lake Mills, Wisconsin
12697	Clarostat Mfg. Co. Dover, New Hampshire
14099	Semtech Corp. Newbury Park, California
14193	California Resistor Corp. Santa Monica, California
14298	American Components Inc. Conshohocken, Pennsylvania
14752	Electro Cude Inc. South Pasadena, California
15818	Amelco Inc. Mountain View, California
15909	Daven Division Thomas A. Edison Ind. McGraw Edison Co. Livingston, New Jersey
16332	Milwaukee Relays Inc. Cedarburg, Wisconsin
16473	Cambridge Scientific Industries Inc. Cambridge, Maryland
17069	Circuit Structures Lab Santa Ana, California
17856	Siliconix Inc. Sunnyvale, California
17910	Continental Device Corp. Hawthorne, California
18083	Clevite Corp. Transistor Division Palo Alto, California
19429	Montronics, Inc. Seattle, Washington
19701	Electra Mfg. Co. Independence, Kansas
24655	General Radio Co. West Concord, Mass.
28520	Heyman Mfg. Co. Kenilworth, New Jersey
33173	General Electric Co. Tube Dept. Owensboro, Kentucky
37942	P. R. Mallory and Co., Inc. Indianapolis, Indiana
38315	Honeywell Inc. Precision Meter Division Manchester, New Hampshire
42498	National Company, Inc. Malden, Massachusetts
44655	Ohmite Mfg. Co. Skokie, Illinois
49671	Radio Corp. of America New York, New York
53021	Sangamo Electric Co. Springfield, Illinois
55026	Simpson Electric Company Chicago, Illinois
56289	Sprague Electric Co. North Adams, Mass.
58474	Superior Electric Co. Bristol, Connecticut
60399	Torrington Mfg. Co. Torrington, Connecticut
62460	USHCO Mfg. Co., Inc. Buffalo, New York
64834	West Mfg. Co. San Francisco, California
65092	Weston Instruments Div. of Daystrom, Inc. Newark, New Jersey
66150	Winslow Tele-Tronics Inc. Asbury Park, New Jersey
70563	Amperite Co. Union City, New Jersey
70903	Belden Mfg. Co. Chicago, Illinois

71400 Bussman Manufacturing
Division of McGraw Edison Co.
St. Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71468 Cannon Electric Company
Los Angeles, California

71482 Clare, C. P. and Company
Chicago, Illinois

71590 Centralab Div. of Globe
Union, Inc.
Milwaukee, Wisconsin

71707 Coto Coil Co., Inc.
Providence, Rhode Island

71744 Chicago Miniature Lamp
Works
Chicago, Illinois

71785 Cinch Mfg. Co. and
Howard B. Jones Div.
Chicago, Illinois

72005 Driver, Wilber B., Co.
Newark, New Jersey

72092 Eitel-McCullough, Inc.
San Bruno, California

72136 Electro Motive Mfg. Co.
Willimantic, Connecticut

72354 Fast, John E. Co.
Div. of Victoreen Instr. Co.
Chicago, Illinois

72559 Essex Electronics Inc.
Berkeley Heights, New Jersey

72619 Dialight Corp.
Brooklyn, New York

72665 Mallory Battery Company
Cleveland, Ohio

72982 Erie Tech. Products Inc.
Erie, Pennsylvania

73138 Helipot Division of
Beckman Instruments Inc.
Fullerton, California

73293 Hughes Products Div. of
Hughes Aircraft Co.
Newport Beach, California

73445 Amperex Electronic Co.
Div. of North American
Philips Co., Inc.
Hicksville, New York

73559 Carling Electric Inc.
Hartford, Connecticut

73586 Circle F Mfg. Co.
Trenton, New Jersey

73899 JFD Electronics Corp.
Brooklyn, New York

73949 Guardian Electric Mfg. Co.
Chicago, Illinois

74217 Radio Switch Corp.
Marlboro, New Jersey

74306 Piezo Crystal Company
Carlisle, Pennsylvania

74542 Hoyt Elect. Instr. Works
Penacook, New Hampshire

74970 Johnson, E. F., Co.
Waseca, Minnesota

75042 International Resistance Co.
Philadelphia, Pennsylvania

75915 Littelfuse Inc.
Des Plaines, Illinois

76854 Oak Mfg. Co.
Crystal Lake, Illinois

77342 American Machine
and Foundry Company
Potter & Brumfield Div.
Princeton, Indiana

77969 Rubbercraft Corp. of
California Ltd.
Torrance, California

78277 Sigma Instruments, Inc.
South Braintree, Mass.

79136 Waldes Kohinoor Inc.
Long Island City, New York

79497 Western Rubber Company
Goshen, Indiana

80031 Mepco Division of
Sessions Clock Co.
Morristown, New Jersey

80294 Bourns Laboratories, Inc.
Riverside, California

80583 Hammarlund Company, Inc.
New York, New York

80640 Stevens, Arnold Co., Inc.
Boston, Massachusetts

81073 Grayhill Company
La Grange, Illinois

81439 Therm-O-Disc Inc.
Mansfield, Ohio

81483 International Rectifier Corp
El Segundo, California

81590 Korry Mfg. Co.
Seattle, Washington

82376 Astron Division
Renwell Industries Inc.
East Newark, New Jersey

82389 Switchcraft Inc.
Chicago, Illinois

82872 Roanwell Corp.
Brooklyn, New York

82877 Rotron Mfg. Co., Inc.
Woodstock, New York

82879 Royal Electric Corp.
Pawtucket, Rhode Island

83003 Varo Mfg. Co., Inc.
Garland, Texas

83298 Bendix Corp.
Red Bank Division
Red Bank, Eatontown,
New Jersey

83330 Smith, Herman H., Inc.
Brooklyn, New York

83478 Rubbercraft Corp. of Am.
New Haven, Connecticut

84411 Good All Electric Mfg. Co.
Ogallala, Nebraska

86689 R. M. B. Corp.
Los Angeles, California

88419 Cornell-Dubilier Elec. Corp.
Electro-Mechanical Div.
Fuquay Springs,
North Carolina

88690 Essex Wire Corp.
R. B. M. Division
Detroit, Michigan

89536 Fluke, John, Mfg. Co., Inc.
Seattle, Washington

89730 General Electric Company
Newark Lamp Works of
Lamp Division of Consumer
Products Group
GECO
Newark, New Jersey

90205 Best Stamp and Mfg. Co.
Kansas City, Missouri

90211 Square D Company
Chicago, Illinois

90303 Mallory Battery Company
North Tarrytown, New York

91293 Johanson Mfg. Co.
Boonton, New Jersey

91407 Superior Electric Company
Oak Park, Illinois

91662 Elco Corp.
Willow Grove, Penn.

91737 Gremar Mfg. Co., Inc.
Wakefield, Massachusetts

91802 Industrial Devices, Inc.
Edgewater, New Jersey

91929 Minneapolis Honeywell
Regulator Company
Micro Switch Division
Freeport, Illinois

91934 Miller Electric Co., Inc.
Pawtucket, Rhode Island

93332 Sylvania Electric Products Inc.
Semiconductor Products Division
Woburn, Massachusetts

94145 Raytheon Company
Semiconductor Division
California Street Plant
Newton, Massachusetts

95146 Alco Electronics Mfg. Co.
Lawrence, Massachusetts

95264 Lerco Electronics Inc.
Burbank, California

95303 Radio Corp. of America
Comm. Receiving Tube &
Semiconductor Division
Cincinnati, Ohio

95354 Methode Mfg. Co.
Chicago, Illinois

95712 Dage Electric Co., Inc.
Franklin, Indiana

96733 San Fernando Electric Mfg. Co.
San Fernando, California

96881 Thomson Industries, Inc.
New Hyde Park
Long Island, New York

97945 S. S. White Dental Mfg. Co.
Plastics Division
New York, New York

97966 CBS Electronics Div. of
Columbia Broadcasting
System, Inc.
Danvers, Massachusetts

98094 Penta Laboratories, Inc.
Santa Barbara, California

98388 Accurate Sales Company
Culver City, California

98743 James Vibrapower Corp.
Chicago, Illinois

98925 Semiconductor Division
of Clevite Corp.
Waltham, Massachusetts

99120 Plastic Capacitors, Inc.
Chicago, Illinois

99217 Southern Electronics Corp.
Burbank, California

99515 Marshall Industries
Electron Prod. Div.
Pasadena, California

Revised May 15, 1966
Using H4-2 Dated March 1963

WARRANTY

The JOHN FLUKE MFG. CO., INC. warrants each instrument manufactured by them to be free from defects in material and workmanship. Their obligation under this Warranty is limited to servicing or adjusting an instrument returned to the factory for that purpose, and to making good at the factory any part or parts thereof; except tubes, fuses, choppers and batteries, which shall, within one year after making delivery to the original purchaser, be returned by the original purchaser with transportation charges prepaid, and which upon their examination shall disclose to their satisfaction to have been thus defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at a nominal cost. In this case, an estimate will be submitted before work is started, if requested.

If any fault develops, the following steps should be taken.

1. Notify the John Fluke Mfg. Co., Inc., giving full details of the difficulty, and include the Model number, type number, and serial number. On receipt of this information, service data or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the instrument prepaid, and repairs will be made at the factory. If requested, an estimate of the charges will be made before the work begins, provided the instrument is not covered by the Warranty.

SHIPPING

All shipments of John Fluke Mfg. Co., Inc. instruments should be made via Railway Express prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be thoroughly inspected immediately upon receipt. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to John Fluke Mfg. Co., Inc. Upon receipt of this report you will be advised of the disposition of the equipment for repair or replacement. Include the model number, type number, and serial number when referring to this instrument for any reason.

The John Fluke Mfg. Co., Inc. will be happy to answer all application questions which will enhance your use of this instrument. Please address your requests to:

JOHN FLUKE MFG. CO., INC., P. O. BOX 7428, SEATTLE 33, WASHINGTON

Change/Errata Information

Issue No: 1 8/78

This change/errata contains information necessary to ensure the accuracy of the following manual. Enter the corrections in the manual in the order given.

MANUAL

Title: 845A & 845AB HIGH IMPEDANCE VOLTMETER – NULL DETECTOR

Print Date: NOV. 1967

Rev and Date:

C/E PAGE EFFECTIVITY

Page No.	Print Date
1	8/78
2	8/78
3	8/78

CHANGE#1–6282

Make the following changes:

ADD:
Paragraph 1-2: the input impedance is ~~10~~ 1 megohms

Paragraph 1-4: 10 Megohms on the 3 millivolt through 100 millivolt range

Paragraph 1-4: ~~10~~ 1 megohms on ~~100~~ 1 millivolt range and below

Paragraph 2-36: In the 1 microvolt to 1 millivolt ranges, a ~~10~~ 1

Paragraph 2-36: creased on these ranges by disconnecting the ~~10~~ 1 megohm

Paragraph 2-36: Typical input resistances with the ~~10~~ 1 megohm resistor

Paragraph 3-14: Volt and below, a ~~10~~ 1 megohm resistor, R104 is con-

On A3 Amplifier Assembly make the following changes:

R104/C3-M2/Res, ~~car~~ met flm ~~10~~1M ~~±1/2%~~ 1.0%, 1W/~~4703-107748~~177188/~~19701~~/~~DC1~~/91637/MFF11004F

1 Part number 4710-19441 5, must be ~~ordered.~~ replaced.

On the Functional Schematic change R104 from 10M to 1M.

CHANGE #2–9296

On A2 Front Panel Assembly make the following changes:

I3-T2/Knob, LEVEL/2405-~~158949~~341396/89536/2405-~~158949~~341396/2

K3-T2/Knob, POWER/2405-~~158956~~341339/89536/2405-~~158956~~341339/1

I1-R3/Knob, RANGE/2405-~~170035~~434183/89536/2405-~~170035~~434183/1

J3-T3/Knob, Zero/2405-~~158949~~341396/89536/2405-~~158949~~341396/1

CHANGE #3–10330

On A4 Power Supply P/C Assembly make the following changes:

C203/H2-T1/Cap, ~~plste~~ mylar, 1 μF ±20%, ~~250V~~ 200V/1507-~~190330~~106450/~~73445~~/89536/X663UW-10502/~~C280AE/P1M~~/1

CHANGE #4–10873

On A4 Power Supply P/C Assembly make the following changes:

R206/G4-T5/Res, var, WW, ~~2k~~ 3k ±5%, 1¼W/4702-~~160705~~112458/11237/Type 110/~~Ref~~ 1

CHANGE #5–11551

On A3 Amplifier P/C Assembly make the following changes:

Q111/I4-U2/Tstr, Type ~~2N1304~~ MPS6520/4805-~~117127~~ -218081/01295/~~2N1304~~ /MPS6520/1/1

Q112/I2-U2/Tstr, Type ~~2N1305~~ MPS6522/4805-~~190298~~ -229898/95303/~~2N1305~~ /MPS6522/1/1

Q106/H5-R4/Tstr, T.I. Type ~~GA2877~~ GA3938/4805-~~182709~~ -321398/01295/~~GA2877~~ /GA3938/2/1

Q113/F1-S3/Tstr, T.I. Type ~~GA2875~~ GA3937/4805-~~182691~~ -454843/01295/~~GA2875~~ /GA3937/3/1

A3/ /Amplifier P/C Assembly/1702-~~194399~~ -359828/89536/1702-~~194399~~ -359829/Ref

Q114/F1-T2/Tstr, T.I. Type ~~GA2877~~ GA3938/4805-~~182709~~ -321398/01295/~~GA2877~~ /GA3938/Ref

On A4 Power Supply P/C Assembly make the following changes:

Q201/Hi-Si/Tstr, ~~T.I.~~ Si, PNP Type GA2817/~~4805-182600/01295/GA2817~~ /4818-380394/89536/380394/2/1

Q202/G5-S5/Tstr, T.I. Type GA2817/~~4805-182600/01295/GA2817~~ 4818-380394/89536/380394/Ref

Q203/H2-U4/Tstr, ~~T.I.~~ Si, NPN Type ~~GA2875~~ GA2817/4805-~~182691~~ -454843/01295/~~GA2875~~ /GA2817/Ref

Q204/H4-U3/Tstr, ~~T.I.~~ Si, NPN Type ~~GA2875~~ GA2817/4805-~~182691~~ -454843/01295/~~GA2875~~ /GA2817/Ref

ERRATA #2

On page 3-1, change all reference of: "The amplified dc signal" to "The amplified ac signal".

On A3 Amplifier P/C Assembly make the following changes:

Q102/G1-N2/Tstr, ~~Selected transitron Type ST-1705F~~ Type S19254/4805-~~198812/89536/4805-198812~~ -168716/07263/S19254/1/1

On A1 Chassis Assembly:

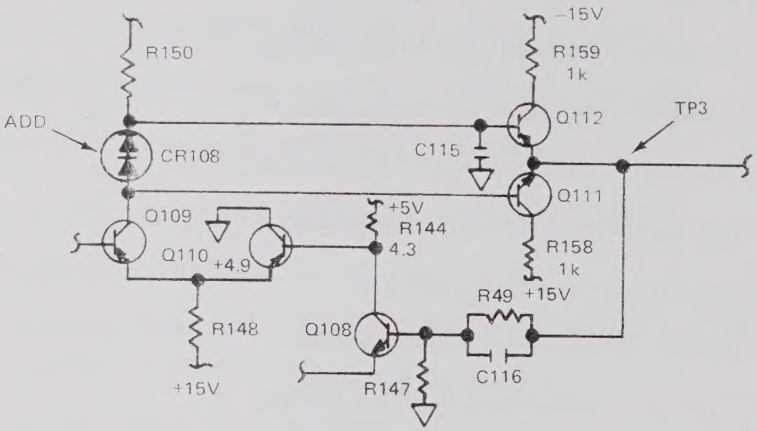
BT201/Battery, 1.2 μV, Ni-cad/4002-160390/~~05397/C1.2A~~ /06860/1.2SCL/8

CHANGE #6–11750

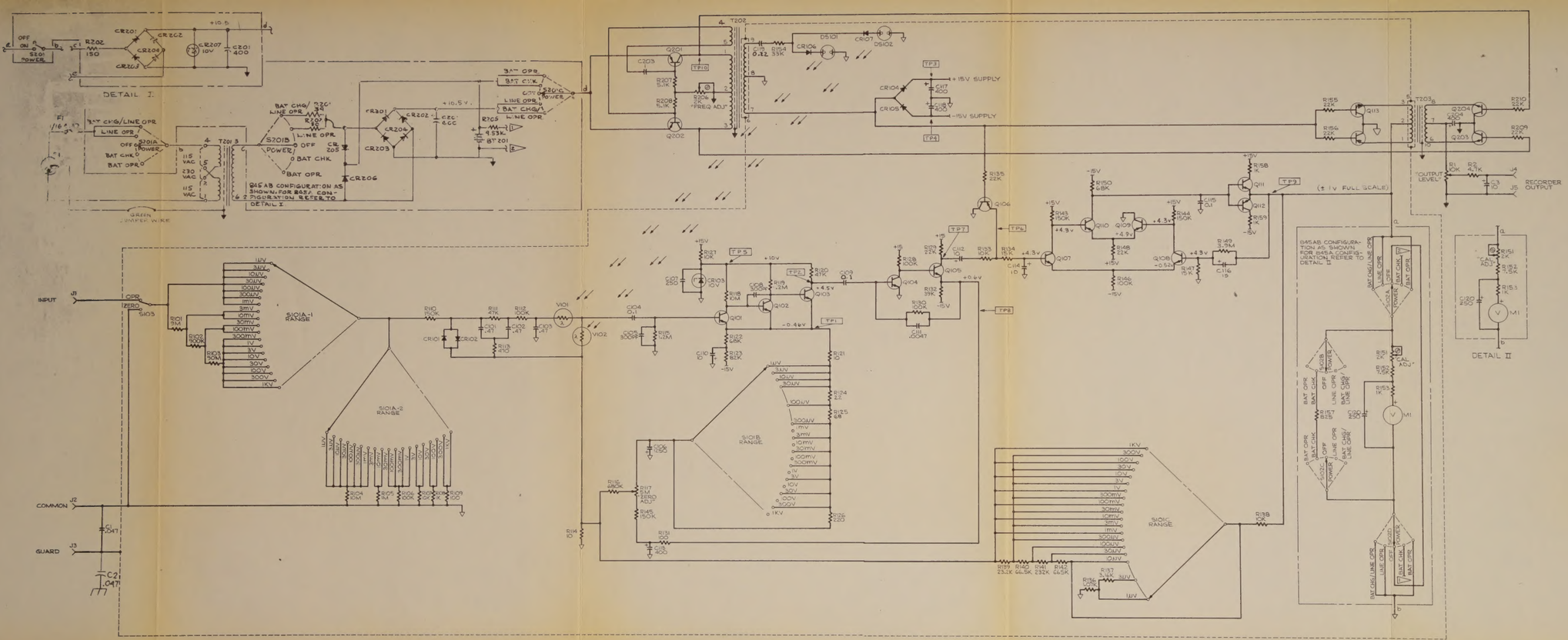
On A3 Amplifier P/C Assembly make the following changes:

ADD: CR108/Diode, multi-pellet, MPD200/4807-375477/09214/MPD200/1

On Functional Schematic make the following changes:



MP MASTER
MA25193



REFERENCE DESIGNATIONS:
BT 201
C1-3, 101-120, 201-207, 301-304
CR101-107, 201-207
DS101-102
J1-5
M1
P1
Q101-114, 201-304
R1-3, 101-199, 201-299, 205-210
S101-103, 201
T201-203
V101-102

NOTES:
- ALL ELEMENTS WITH THE SAME NUMBER ARE CONNECTED.
- INDICATES POWER SUPPLY COMMON.
- INDICATES NULL DETECTOR COMMON.
- INDICATES CHASSIS GROUND.
- INDICATES INTERNAL ADJUSTMENT.

UNLESS OTHERWISE INDICATED RESISTANCE IS IN OHMS AND CAPACITANCE IS IN MICROFARADS.

CHANGES:
① FOR SER. NOS. 123 THRU 370: PREVIOUS TITLE WAS: "NULL DETECTOR/ MICROVOLTMETER."

FUNCTIONAL SCHEMATIC
① HIGH IMPEDANCE VOLTMETER / NULL DETECTOR
MODEL 845A & 845AB
MODEL 845A & 845AB SER. NO. 123 & ON
FLUKE JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133